QUANTITATIVE RESEARCHES CONCERNING CALORIC NYSTAGMUS

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ARNOLD BUSCK
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Konsistorium, den 3die Juni 1878.

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Denne Afhandling er af det lægevidenskabelige Fakultet antagen til offentlig at forsvares for den medicinske Doktorgrad.

København, den 8. Januar 1925.

V. Bie,
f. T. Dekanus.

A. Rosenberga Bogtrykkeri-City Passagen

PREFACE.

This work was done at the otolaryngological section of the Rigshospital, when I was acting as second assistant.

I am indebted to Professor Schmiegelow for the interest with which he followed my investigations, and the great kindness shown to me in placing his library at my disposal.

I thank Professor Rasch for permission in making use of the journals from section H.

Moreover, I offer my thanks to the hospital nurses in the otolaryngological section for their great assistance, without which I should not have been able to accomplish these researches.

A. P.

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INTRODUCTION.

The writing of this treatise is due to Professor Vald. Henriques. As an opponent ex officio at an otological dissertation the professor pointed out, that the methods generally employed in measuring caloric reaction were erroneously based, and that, in order to procure a perfectly efficient standard of measurement it would be necessary to measure just that temperature-excitation capable of evoking reaction from the vestibular apparatus. Professor Schmiegelow, my chief physician, at that time, saw that this was right, and his incentive caused me to take up the following researches.

The result thereof is set forth in the following.

N.B. In this work it must be especially noted that the cipher ÷ is used troughout for minus.

HISTORICAL REVIEW.

Already in his foundamental work of 1906 Barany mentions some measurements carried out by means of the caloric test, which he performs by means of an atticus-pipe, introduced as closely as possible to the tympanic membrane or labyrinth wall. The water is obtained from a big Politzer-balloon, connected with the pipe by a rubber tube. Besides describing the vestibular reactions, now commonly known, he states having evoked nystagmus on radically operated individuals already after 5—10 seconds. The lowest temperature he uses is 12°. On radically operated or in chronic suppurations with considerable perforation, he can often evoke nystagmus already at 35°. The duration of nystagmus is indicated to be 90—120 seconds. Flushing with water of body temperature does not induce nystagmus, and if the body temperature is increased, the temperature of the flush-water must be increased correspondingly. He has thus once evoked »cold-water nystagmus« by using water of 40°. Later on in the conclusions he points out that, in order to avoid nystagmus by flushing the ear with water, one must take care that it is just of body temperature, as water differring but 1° under certain circumstances causes dizziness, indisposition and nystagmus. Barany's work of 1907 only slightly refers to the caloric test; but he, however, writes, that by using it one may occasionally be enabled to demonstrate with certainty signs of an increase or decrease of the irritability, and that by simultaneous flushing of both ears with water of the same temperature, provided the drum membranes are alike, he can acquire knowledge as to the difference in irritability between the two sides. As to the rest, his work essentially deals with the rotatory test.

Kiproff used an atticus-pipe for flushing. An irrigator containing the water was placed level with the top of the patient's head; between the tube of the irrigator and the atticus-pipe a thermometer was inserted; the temperature of the water was 30°. The patient sat upright with his head straight, glancing to the side not under treatment. Simultaneously at the commencement of the flushing a stop watch is started. At the moment nystagmus appears he notes the number of seconds elapsed, whereupon he makes the patient look straight ahead, when the flushing is continued until nystagmus sets in anew; the seconds passed are again recorded,

and the flushing is discontinued. The duration of nystagmus is then measured until it ceases, that is, until on glancing sidewards no trace of nystagmus is perceived; then the watch was stopped. If spontaneous nystagmus was observed, he made the patient, by means of Barany's eye fixator, direct the glance in such a way that the spontaneous nystagmus disappeared and then proceeded with the test as described.

He has, in this way, examined 127 vestibular apparatuses, some normal, some pathological. In his table I. he has collected 34 normal cases, 7 with chronic tuba-middle-ear catarrh, and 5 with secretory middle-ear catarrh, as they gave identical results, showing that nystagmus on an average appears after 15—30 seconds on glancing sidewards, and after 25—60 seconds on looking straight ahead. In the former the shortest and longest times measured are respectively 10 and 60 seconds, in the latter 15 and 150 seconds. In table II. there are 9 cases of chronic suppuration, showing almost equally varying results. In 4 of them, with particularly early appearance of nystagmus (within 15 seconds) there was a total defect of the drum membrane, and of those gradually appearing, 2 had very small perforations and 4 had granulations.

Table III. comprises 7 cases of total destruction of the drum membrane with epidermising of the tympanum and 3 cases of suppuration after radical-operation. In 8 of these 10 cases nystagmus made an appearance within 10—20 seconds on glancing sidewards, that is earlier than normally, because — as he says — he flushes right upon the labyrinth wall. Finally in table IV. he has 15 cases of acute otitis media, of which 2 with mastoiditis, and here great differences are found in the appearance of nystagmus; the minimum and maximum being 15 and 165 seconds, averaging 20—55 seconds, all on glancing sidewards. The duration of nystagmus (here, as already mentioned, the time of flushing is included) is in table I. 115—185 seconds, in tables II. and III. 85—165 seconds, in table IV. 115—185 seconds, i. e., longest in normal persons and in acute otitis, from which he draws the conclusion, that the function of the vestibular apparatus is somewhat impaired by the chronic otitis, especially when it has involved a lesion of the cochlear apparatus. He has also compared the duration of nystagmus for right and left ear, and says that most frequently it is longer for the right, as also ascertained by Barany by the rotatory test.

Bela Freystadtl employing the same technique as Kiproff examined 20 individuals with normal hearing and 10 suffering from chronic middleear suppuration. His investigations particularly aimed at determining whether the duration of nystagmus evoked by the caloric test, is constant in the same person on being tested the same day repeatedly, and on different days. He found the duration of the caloric nystagmus in the 20 normal persons to average 152 seconds, (min: 85, and max: 205 seconds), the difference in duration by repeated flushings averaged 12 seconds (min: 0, max: 25 seconds, in one case 55 seconds). In the 10 cases of chronic suppu-

ration the duration was shorter, average 118 seconds (min: 55, max: 180 seconds); by repeated flushings the difference averaged 11 seconds (min: 0, max: 30 seconds). In some cases he has made the flushings with short intervals (5 min.) and found that the time of latency shortened some seconds, while on the other hand the duration of nystagmus here was rather constant. In respect to the time of latency by repeated flushing the 40 normal ears did not show any distinct difference, whereas in those suffering from chronic suppuration there was a shortening of some few seconds.

Hautant substantially confines himself to stating that as a rule the reaction on using water of 15° appears within 30—40 seconds, quickly reaching its maximum, and lasting about 2 min.

Beck[1]) is of the opinion that Kiproff's investigations make it appear likely, that the time of latency for caloric nystagmus in individuals with sound labyrinths depends upon extra-labyrinthine conditions, whereas the duration of nystagmus is subject to influences from the labyrinth or cerebral centres. In order to elucidate this, he then examines acute otitis at different stages, where hyperemia, secretion in the middle-ear, and so forth, cause various hinderances to the heat-conduction. His way of investigation is similar to that of Kiproff. He examined 4 patients during their illness, and found that the time of latency fluctuated from the juncture when the inflammation was at its height, and was supposed to afford the greatest hindrance, until it had partly abated, in such a way, that the time of latency was longest when the inflammation was at its height, and decreased gradually together with the inflammation. He also found that »Tonogen« (a fluid that reduces the hyperemia), when dropped into the ear shortens the time of latency. The duration of nystagmus, on the contrary, was constant in the same patient during the tests, and hence he concludes that it is labyrinthally — or centrally — conditioned.

Brünings in 1911 framed his well-known quantitative method on constructing his oto-calorimeter, by means of which he arrives at making the conditions of test identical in each case. As regards a description of the oto-calorimeter itself I shall refer to Brünings' own work, merely pointing out that he examines his patients in the optimum position, described by himself in the same work, viz: with the head recumbent at 60 degrees, whereby he is of the opinion that he gets in most cases, the horizontal archway placed in a vertical position. He then makes the patient look 50 degrees sideways and flushes with water of 27°, measuring the amount passing the ear until the moment when nystagmus sets in. He finds the average is 70 ccm. at which the majority of the patients showed reaction, and calls this »Erregbarkeit 1«, at the same time there are normal cases reacting already at 50 ccm., and others not reacting before 100 ccm., and these he calls respectively »Erregbarkeit $1^1/_2$ and $^3/_4$«, and as not even all normal patients come within these limits, he adds that the limit value proposed, viz: between $1^1/_2$ and $^3/_4$, only means that 80% of all normal ones

react within these limits. Furthermore he remarks that by the functional test of the archway apparatus, as also by other organs of sense, one cannot speak of an absolute normal time. He is also conscious of not obtaining by this method any real scale of the sensibility, writing as he does: »es wäre deshalb rationeller mit verschiedenen Temperaturen bei gleicher Einwirkungszeit zu prüfen, was aber auf unüberwindliche praktische Schwierigkeiten stösst«. Regarding his pathological cases I shall here merely quote, that he found increased reaction by large perforations of the tymp. mem. likewise in cholesteatoma and adhesive processes, where the conduction was improved, but decreased reaction in granulations, in contractions and the like in the outer ear passage, the reaction might be entirely precluded.

Zalewski has tested Brünings' investigations. He examines the influence which the different visual directions bring to bear at the moment nystagmus makes its appearance, and finds that in 12% of the cases the visual direction was a matter of indifference; in 28% nystagmus appeared earliest when looking straight to the front, and in 60% when glancing sidewards. Moreover he finds that the time of latency varies considerably at different times, even in the same patient, and that data for comparison between normal and pathological cases can only be acquired by observing a considerable number of cases. In cases with catarrhal changes in the middle ear and tuba, such as in acute suppurations, decreased irritability is observed; but he ascribes these effects to the changes in the middle ear. In patients with vertigo he generally finds decreased irritability.

Albrecht has examined aviators a. m. Brünings. He found that 26,6% gave reaction to 70 ccm. water, 40% to between 50 and 95 ccm., thus within the normal limits as indicated by Brünings. But not less than 33,3% came outside these limits, showing reaction to between 30 and 135 ccm. Among the same were several prominent military airmen, whence he concludes that the caloric nystagmus test is of no significance in judging an individual's qualifications as aviator.

Ruttin has by his double-flushing method succeeded in indicating a relative scale for the irritability of one ear as compared with the other. Both ear are exposed to an even caloric excitation and by means of this he gets the ear that reacts most easily to gain the upper hand so that, for instance, a cold bilateral flushing results in nystagmus appearing on the least affected side; but as to whether there is hyper-irritability in one side, or hypo-irritability in the other, no information is afforded; and in cases of diseased changes on both sides the information obtained is uncertain and questionable. Moreover, he points out that — without it being necessary to ascribe it to any labyrinthine changes — in cases of one sided perforation of the tympanic membrane quicker reaction may take place on this, and that the reverse may take place in cases of granulations or cholesteatoma. Furthermore, to explain that the test sometimes shows a contrary result, he assumed

the existence of inhibitory fibres, which at times may be destructive.

Lang[1]) has, by means of Ruttin's flushing method, examined 150 normal individuals, i. e., having normal tymp. mem. and found that in 110 no nystagmus occurred; as to the remainder it appeared on closer interrogation, that at some time or other in their life they had been subject to dizziness, but that during the latter 1—5 years they had not suffered from it, or that the attacks had been very mild, not causing any inconvenience.

Davranches uses water of 20—25°, the basin being placed 50 ctm. above the ear, and he observed nystagmus from behind dim eye-glasses. On side glance, nystagmus sets in after flushing with 25° with 20—45 seconds, on looking through dim glasses after 30—60 seconds. The duration of nystagmus fluctuates from 45 to 110 seconds. The two ears of the same individual show very slight differences. Simultaneous flushing of both ears of 10 individuals gave in 7 cases bilateral nystagmus, in 2 single-sided, and in 1 case no nystagmus, but dizziness. In persons over 50 years of age he always obtains retarted appearance of nystagmus, without, however, giving any figures. The same is the case in acute, non-perforated otites (from 45—105 seconds); in 3 slight dizziness only, but no nystagmus, and in 1 case there was no reaction whatever. Perforated acute otites give about the same results. Greatly retarded reaction also appears in acute mastoiditis; in 2 cases where no reaction was shown, the labyrinth most probably has not been affected. In chronic otites there is not so much occasion for making mistakes as in the acute ones, although quick reaction is shown in defects of the tymp. mem., and slow reaction in polypus formations and the like. Cerumen and wad-tampon in the ear passage may retard, but do not hinder the reaction.

Beck[2]) criticises Davranches' investigations, considering his results as due to a technique which is not quite accurate. He strongly emphasizes that in Ruttin's double-flushing, one must be very careful to note that the conditions are exactly the same on both sides, and that equal quantities of water are administered. He has examined 20 normal individuals and not found nystagmus in any of them, excepting at the beginning of the test in one case of passing nystagmus, which disappeared again within a few seconds, and he therefore expresses the opinion, that one must continue flushing for at least 3 min.

Kallmann has made tests by syringing the ear with ice-cooled air instead of water, and opines that it gives finer results. The time of latency was on glancing sidewards 35—40 seconds (in total defect of tymp. mem. 10 seconds), and on looking straight ahead, 50—76 seconds (in total defect 19 seconds). The duration of the nystagmus evoked was 129—160 seconds. He does not, however, adhere to the opinion that the caloric test is practicable for quantitative investigations, but thinks that its significance is

rather quite individual, where only a comparison between both ears of the same person, can indicate the difference in irritability.

Oskar Boeters has in 1914 made investigations of rotatory and caloric nystagmus. In his caloric tests he uses Brünings' oto-calorimeter, and also optimum position, eye-fixation 50 degrees sidewards, and water of 27°. Regarding the oto-calorimeter he says that he makes the water flow at the rate of 150 ccm. a minute, compared with Brünings' rate of 100 ccm., but adds that he has met with difficulties in causing the stream to flow uniformly, and doubts whether in any case he has succeeded in doing so. Of course these objections to the oto-calorimeter are of rather decisive importance. According to him limits in 78% of the normal cases are between 45 and 70 ccm., averaging 62 ccm., that is considerably lower than Brünings' 69 ccm. The difference in the appearance of nystagmus on right and left side is quite slight, generally 0—20 ccm.; 15 times he has found greater differences: 35—40—70 ccm. The average is 13 ccm. Right side nystagmus is in 57 instances later in appearing, left side in 41; in 10 instances they are equal. Repeated testings of the same patient show differences of 0—15 ccm., in 5/6 of the 49 cases of repeated tests the difference averages 11 ccm.; but also greater differences are found e. g. 30 ccm., and once 60 ccm. In respect to sex influence, he finds that women on an average react at 53 ccm., men after 62 ccm., and thinks that this is due to the feminine tissue being more tender and permeable to cold-excitations. The age influence manifests itself thereby that the caloric irritability decreases with age, as the amount of water is increased, from 54 ccm. at 15 years to 74 ccm. at 60 years of age. This he ascribes to the increase in the inspissation of the tympanic membrane, as he did not find any difference with the rotatory test. Comparing the rotatory and the caloric test he did not find any law-directed conformity; it was only by grouping a great number of results of both methods that he found cohesion in such a way that an early appearance of nystagmus by the caloric test corresponded with a long after nystagmus by the rotatory test, but between the individual cases no conformity was visible.

Swan, Oxon and Lake have in 1918 examined 110 individuals, including 80 aviator cadets, who were all declared fit for service. They used 100 ccm. water at 60° Far. and it was 60 seconds in running out. The test shewed large margins; the time elapsing before the appearance of the first signs of nystagmus averaged 50 seconds (41 cases); the duration was 37 seconds. In their opinion there did not seem to be any constant duration of nystagmus, nor any constant time for its setting in, and that in normal individuals these times varied in respect to the different persons. In 13 cases no nystagmus occurred, only great dizziness, under the given conditions. They give no detailed description of their testing arrangements, but from their results they come to the conclusion, that it is better to go down to a temperature of 55° Far.

Herrmann Streit examined 900 normal individuals as to

their fitness to become aviators, testing their caloric function. He used Brünings' oto-calorimeter, letting the individual either keep his head in an upright position, or in Brünings' optimum position. In the former position he used water of 19°, and finds great variations, the average being 140—170 ccm. before the appearance of nystagmus and he concludes by saying that doubtless there are normal cases, where it is difficult to evoke caloric nystagmus with an upright position of the head, and that consequently one must be careful not to draw too far reaching conclusions from this test. In a recumbent position of the head he uses water of 21°, and on an average 30—40 ccm. to produce reaction.

S. H. Mygind has made use of the caloric test only to a limited extent, as he regards it as being uncertain, and technically subject to many sources of error, in which respect he particularly points out that by using Brünings' oto-calorimeter, according to Brüning's directions, one gets variations in the values of nystagmus of up to 10%, when the temperature of the flush-water is only changed 1°, and furthermore the results is greatly influenced by changing either the position of the head or the direction of the glance merely 10 degrees. He has also met with difficulties in making the water flow steadily; but the principal objection he considers is, that the caloric test performed in this way, depends upon the shape of the ear-passage, and the condition of tymp. mem., the middle ear, and the lateral wall of the labyrinth.

Thornval[1]) has not made actual measurements with the caloric test; he always induces a very powerful reaction; measures the amount of water used and judges whether the nystagmus is more strongly pronounced on the one side than on the other. Only when comparing the effect of the coldwater flushing with that of the warm, he has essayed flushing the ear successively with cold and hot water, both differing in an equal degree from the body temperature. In these tests he stopped his flushing at the moment nystagmus set in, and starting a stop-watch he measured the duration. Thereby he found that on an average some more water was required to evoke nystagmus with warm than with cold water, both as regards the horizontal and the vertical archway; and if we take his figures concerning the duration, we learn that for the horizontal archway it is somewhat longer with warm than with cold-flushing, while the contrary is the case as regards the vertical. The difference is not great, however, and the material very scanty, so that conclusions are scarcely permissible. Moreover Thornval has tested Ruttin's double-flushing (the technics being somewhat modified, however), on 61 normal individuals, and in 4 cases only found a weak reaction on one of the sides. In pathological cases he always got a quick and clear reaction. On babies, some few days old only he[2]) regularly got reaction when flushing with 30° water, after a time of latency of 5—10 seconds (generally 7—8 seconds).

Borries[1]) regards it possible in fairly clear cases by judgment to diagnose increased or decreased reaction without making use

of the measuring methods: he commends repeating the examination, and is of the opinion that, when arriving several times at the same result, one can as a rule diagnose with certainty. Regarding double-flushing he opines that it has been advantageous in repeated tests, to diminish the flushing of the first reacting ear; and when reaction takes place from this same ear in spite of the reduction of the amount of water used, one is permitted to conclude, that this is more easily excited than the other an argument that may, doubtless, often afford a guarantee against erroneous conclusions. He has not performed any measurements of irritability.

Kobrak has put the caloric test in a new track by indicating that it is not at all necessary to continue flushing until nystagmus appears. He thus performs the caloric test on the principle, that after having flushed the ear with 5 ccm. water he just waits for the reaction to take place, and after a few seconds latency he finds nystagmus sets in.

This method he has now endeavoured to work out with a view to measuring quantitatively the excitability of the vestibular apparatus, and describes his mode of proceeding in this manner [1]): First he flushes with 5 ccm. 27° water, and then waits to see if, after several seconds, no nystagmus sets in. If it does not, he then pauses for at least one minute, and tests with 10 ccm. 27° water, and so on until nystagmus appears for instance at 20 ccm. After having got reaction he pauses for at least 5 minutes in order to let the lymph-circulation and the irritation of the vestibular nucleus subside, and then he tests with 15 ccm. If reaction is obtained here, then the limiting value is 15 ccm. 27°, otherwise it is 20 ccm. 27°. Besides measuring the minimum of flush-water, he here also determines the time of reaction, i. e. the time elapsing from the moment of the excitation until the appearance of the first stroke of nystagmus; and, moreover, he states that with normal individuals he can occasionally produce reaction by using 5 ccm., and even $2^1/_2$ ccm. water of 35°. Later on he [4]) somewhat modifies his tecnique laying more stress on the flushings being small than on the temperature being kept near the body temperature, and proceeds to lower the temperature, maintaining however the 5 ccm., for he always begins testing with 5 ccm. 27° water. The following must now be recorded 1) temperature and quantity of water (mostly 5 ccm., at the outside 10 ccm.), thereby establishing the power of excitation required for the irritability-limit, 2) the time of reaction, 3) the force of reaction, that is: whether only the slow component is evoked, or some initial twitches, or whether there are rhythmical spasms. Finally one can, for the sake of the completeness, quote the duration of the rhytmical nystagmus, possibly also the number of strokes; to this latter point, however, he attaches less importance as to the estimation of the irritability of the peripherical vestibular apparatus. Kobrak [2]) also introduces a new idea called »nystagmus readiness«, meaning thereby that a labyrinth under certain circumstances is in a condition, where

caloric reactions is affected more easily than normally, which, for instance, is said to occur sometimes in an ear, in cases where the other ear suffers from acute or chronic suppuration. An ear is likewise in »nystagmus readyness«, when it has just been exposed to caloric excitation; sometimes also when the test has been performed on the other ear. In many instances he has found that no reaction could be obtained by means of the formerly employed methods, which he calls: »Massenspülung«, whereas clear reaction was obtained by his »Minimalreiz«, and this he explains by declaring, that a sort of checking, »Dämpfung«, of the reaction is produced by the large flushings, which he therefore thinks should be omitted. Numerous theoretic reflexions, which he, furthermore, pursues in his works, concerning the caloric test and the entire static system, are of lesser interest to the matter in question.

Grahe [1&2]) is the first who has put to the test Kobrak's method as to its adaptability for quantitative measurement. He places the patient with a support for the head (without mentioning its position), looking straight ahead through Bartel's glasses, and injects 5 ccm. water in the course of 2 seconds, temperature generally 27°; in pathological cases he uses lower temperatures. The setting in of reaction he counts from the moment the pupils move slowly out from the middle line, and finds that nystagmus in most of the normal cases sets in 14—20 seconds after the injection, and ceases after 100—140 seconds. However, he is inclined to give the physiological limits a wider scope, for instance, 10—30 seconds, and 60—200 seconds, stating that this difference occurs, not only in different persons, but also in the same person at different periods, for which reason one is permitted to estimate differences in duration of the irritability, only when it harmonizes with other vestibular symptoms, objective (past-pointing, and falling tendency), as well as subjective (dizziness), and when this difference remains constant by repeated tests. He formulates his impressions in the following manner: »Wir kommen deshalb zu dem Schluss, dass die Schwachreizmetode uns in Form der 5 ccm. Spülung bei Bestimmung der Nystagmusdauer einen guten Anhaltspunkt gibt für die Stärke der Erregbarkeit sowohl im allgemeinen als im Vergleich beider Seiten; es wurde uns aber verfehlt erscheinen, von einer quantitativer Metode zu sprechen. Dazu sind die Schwankungen auch bei normalen zu gross«.

Demetriades and Mayer have tested Kobrak's method in 150 normal cases, by flushing with 5 ccm. water 13—35°; for warm water reaction they use 38—45°. First they try whether nystagmus appears by »Dauercompression« (a lasting pressure on the auditory canal, indicated by Kobrak as being the weakest form of irritation, and commended by him as an attempt to produce nystagmus, which ought to precede any flushing); then they flush with 5 ccm. 13° water, in some few cases also 5 ccm. 25—30°, and if no reaction has set in after 2 min. they use a greater quantity of water of the same temperature. In the cases where water of more than 13° was used, they first go down to

this temperature, before increasing the quantity. They regard the method as a great waste of time on account of the long pauses, and in a number of cases results worth while have not been recorded; consequently they are of the opinion that Kobrak's method, to make it adaptable for clinical examinations would have to be used in an abbreviated form. In the first place then, they set aside the »Dauercompression«, it being difficult to determine, and not having afforded them such reliable results so often as Kobrak; and then they do not try 5 ccm. flushing at different temperatures; »as we cannot perceive what value the determination of the degree of cold, at which the labyrinth reacts should have«, but start flushing with 2—5 ccm. 15° water; and if this does not give any effect, 5 min. later with 10 ccm. (perhaps in Brünings' optimum position), rising to 60 ccm. If this does not give any reaction either, they proceed using greater flushings with 100—200 ccm., whereby they opine to avoid Kobrak's so-called »Dämpfung«. During the flushing the patient looks in the opposite direction; eye-fixator and otogoniometer are not used, warm water flushing only exceptionally. By means of these technics they found in 15 normal individuals, using, at an average, 3 ccm. 13° water, after 25—40 sec. nystagmus of first degree lasting 40—90 seconds; using 5 ccm. 13° water, after 15—30 seconds nystagmus of first degree, lasting 60—120 seconds; vertigo, past-pointing or falling-tendency were not observed in these cases. In pathologic cases they found 1) by chronic catarrhal changes, after flushing with 5 ccm. water of 13°: nystagmus of first-second degree within 10—30 sec., lasting 50—120 seconds; in two cases with spontaneous bilateral nystagmus: nystagmus of second-third degree; in three cases: slight vertigo, but no falling-tendency or past-pointing. 2) By acute suppurations: various insignificant results. 3) By chronic middle-ear suppuration (41 cases): the time of latency shortened in 47%, prolonged in ca. 29.5%, normal in 25.5% (normal time of lat: 15—30 seconds). The duration of nystagmus was shortened in 20.6 %, normal in 58.8%, prolonged in 20%. Among 16 cases of shortened time of latency, (2—10 seconds) 9 had normal, 7 prolonged duration of nystagmus (120—180 seconds). In normal time of latency there usually was normal duration of nystagmus, at a prolonged time of latency (30—60 seconds) as a rule shortened duration (from single spasms to 50 seconds); besides there were no reaction at 5 ccm. 13°. No relation between the different conditions attending the caloric reaction and the state of the drum-membrane could be established, but prolonged time of latency was frequent in granulations in the middle ear, normal in simple perforation, shortened in total defect. 4) In radical-operated, shortened time of latency is generally found, but also normal and prolonged, however; the duration of nystagmus was mostly natural, but also sometimes prolonged and shortened. Vertigo and past-pointing were frequent, falling tendency seldom. 5) In inner-ear diseases (without lues): where the sickness was confined to cochlea, reaction was natural; where the labyrinth was embraced, corresponding modi-

fications were found in the caloric reaction, so that with greater quantities of 15° water nystagmus appeared only after prolongation of the time of latency (120 seconds). In the one case natural reaction was found in spite of the rotary reaction being suppressed. 6) In luetic ear diseases: all cases, except one showing hyper-sensitiveness, had decreased irritability: after flushing with 5 ccm. 13° water either single twitches, or no nystagmus at all is obtained within 50—80 seconds; not before increasing the quantity to 200 ccm., reaction took place, but also then a prolonged time of latency (40—60 seconds), and a shorter duration of nystagmus (40—60 seconsd, in one case 130 seconds), no vertigo, past-pointing or falling tendency. No law-directed relation to the rotatory test was established. Moreover they have examined some cases of organic central nervous affections and acoustic tumors, and express the opinion that their method of investigation is of great value; but plainly it diverges considerably from the one indicated by Kobrak. They have in many cases of luetic inner-ear diseases found the »mass-flushing« give results, where Kobrak's »Minimalheiz« has failed, and maintain, therefore, without denying the existence of Kobrak's »Dämpfung«, that in labyrinthine diseases an increase of the flushing-water acts as a more powerful excitant. In the diagnosis of lower degrees of hyper-irritability, this is based first and foremost, on a shortening of the time of latency (less than 10 seconds; not counting cases where tymp. membrane is deficient); in diagnosing higher degrees of hyper-irritability with shortened time of latency and distinctly prolonged duration of nystagmus; in the diagnosis of lower degrees of hypo-irritability with shorter duration of nystagmus (less than 50 seconds, excepting cases with obstructions in the auditory canal); in diagnosing higher degrees of hypo-irritability with prolonged time of latency and shorter duration of nystagmus. Supplemental characteristics of lower degrees of hyper-irritability are obtained by the occurrence of dizziness, past-pointing, and falling-tendency on 5 ccm. 30° flushing.

Uffenorde follows Kobrak's indications, but terms the reaction positive only when nystagmus by eye-fixation, or by looking straight ahead, is distinct and lasting. In one instance he gets reaction at 10 ccm. 33°, most often not before 10—20 ccm. 28°; it is always only after using greater amounts of water at lower temperature (for instance 50 ccm. 23°) that a rotatory feeling and past-pointing occur. He regards judgment of Kobrak's nystagmus to same side with great reserve, as the eye-muscles are fatigued after side-fixation, and the pause between the flushings is so brief.

Spira[1]) has examined 50 normal individuals a. m. Kobrak. He uses upright-head-position, and flushing with 5 ccm. 26°. After 20—30 seconds, when experience shows that nystagmus may be expected, he makes the individual glance sideways. He is never content with single twitches, but irritates the vestibular apparatus so long as to evoke nystagmus lasting 30—100 sec. If not effected by

water of 26°, he flushes, after pausing 10 min., with 23°, and so on with 20°, 16°, 14°. If nystagmus is not yet evoked at 14°, he doubles the quantity. He has hereby established, that 10 ccm. 23° is of more effect than 5 ccm. 14°. He often got varying results, and considers this to depend upon whether the vestibular apparatus is tired or not, as he got finer reactions when the patient had rested, than when he was tired, after preceding test. Only in 2 of the 50 cases 5 ccm. 14° proved insufficient, while with 10 ccm. 23° he got prompt effect. He states that the extent of excitation for caloric nystagmus is confined to between 14° and 28° when flushing with 5 ccm., and thinks that this quite wide limit is due to the varying conditions of heat-conduction. Besides he has examined 18 unilaterally labyrinthless individuals, using the same methods, and found, that only in one case the irritability of the sound labyrinth was reduced (15 ccm. 18°).

Fischer and Wodak are of opinion that the labyrinthine investigation has come to a dead point, and have therefore undertaken to examine the subjective phenomenons occurring in connection with the vestibular tests together with the objective ones; in addition they investigate the so-called arm-tonus reflex, which, however, will not be entered upon here. For their caloric tests they use Kobrak's minimal-flushing, and find that even an injection of 5 ccm. 30° water, after a certain time of latency produced a characteristic feeling of horizontal rotation to the opposite side; if the amount of water exceeds a certain maximum, or if the temperature falls below a certain minimum, then the affect is not a simple horizontal rotation, but is complicated with wheeling-sensations, which are of constant direction, and strictly analyzable. With stronger irritations a phase is entered into, in which the person tested is unable to indicate definite directions and is subject to »Allgemeinschwindel«. With warm-water flushings identical phenomena arise, only weaker, and hereto they point out that temperatures exceeding 50° are not easily stood, whereas a lowering of the temperature to 10° affords no inconvenience. They endeavoured to establish the irritation-limit evoking rotatory feeling by calorisation, and found that with 3 ccm. a trained person was always able to indicate the rotary feeling in a certain direction, even when the water differed as little as a tenth degree from body-temperature. It was difficult to determine the neutral temperature when no rotatory feeling was evoked; by flushing the individual might doubt whether the water was warm or cold, but from the direction of the rotatory sensation he could certainly always state whether the temperature was over or below the neutral point. During these experiments they observed no traces of nystagmus, a fact which, in their opinion, proves that the rotatory feeling is a much finer test for vestibular affection than nystagmus. It is curious to note that these investigations are published a couple of months after my first communication, in which I state having ascertained nystagmus at the same minor differences of temperature, at which they state having got rotatory effects. The fact that I never have

got rotary effect may very well be due to my not having had attention drawn to this point, as evidently there is question of very delicate sensations, which require a great deal of experience to perceive. The reason why, on the other hand nystagmus has not been found I can not say; it may be ascribed to their having, so to speak, used »freiäugiger Beobachtung«.

The caloric test, performed according to Kobrak's indication has been almost universally accepted, and may probably be the method most commonly used at present; but as been seen by the above, opinions are differ as to when the different authors reckon nystagmus has set in, and, moreover, they all almost invariably use modified tecniques, which make a comparison almost impossible. Its great advantage lies in the fact that it only requires a recording-syringe as regards instruments, but when there is the question of using it for quantitative measurements, a great many object to it as being a very slow process. In my opinion the foundamental point in Kobrak's method is his indication, that it is not necessary to continue the flushing until nystagmus sets in, whereby as a rule the embarrassing subjective phenomena are avoided. Subsequently I shall mention various objections to the method in respect to its use in quantitative measurements. By means of the methods formerly used it has not been possible to determine with certainty changes in the irritability of the vestibular apparatus, or, at any rate, one has not been able to gauge with accuracy such changes; and, at any rate, this is by no means surprising. By means of the rotatory test one cannot examine each ear separately, and although the impression of existing abnormities is assured, one cannot distinguish between the function of the two ears in a satisfactory way, this enabling one to decide as to the extent to which each ear is affected. Moreover by the rotatory reaction the so-called compensations occur, manifesting themselves thereby, that even in cases of only one ear being affected, reduced reaction after rotation is obtained on both sides; and this compensation may occur a fairly short time after the outbreak of the disease. As both ears participate in the reaction, a reliable measurement of the irritability of each ear can never be obtained. The galvanic test, however, may fairly well allow of the gradual examination of each ear separately, but this, so to speak, does not touch the vestibular apparatus itself, being a nerve test, giving reaction even if the labyrinth itself does not function any more. The caloric test is doubtless advantageous in enabling one to examine each ear seperately, but the way it has formerly been done, has proved not to give accurate results. Time of latency or duration of the evoked nystagmus has been measured, but the latter is, according to the now generally adopted opinion, not in proportion to the irritability; and in respect to the time of latency it is by the formerly used methods greatly dependent upon conditions foreign to the vestibular irritability. Extra-labyrinthine circumstances here play a too prominent part in the result, as changes in the tympanic membrane, anatomic peculiarities in the auditory canal and the middle-ear, granulations and the like,

nay merely catarrhal changes in the middle-car, may alter the heat-conductivity, and thus affect the result. Naturally when different authors have arrived at divergent values by these methods, and not even the use of Brünings' oto-calorimeter has made it possible to obtain satisfactory results, these are also naturally influenced by the same extra-labyrinthine conditions already referred to.

Brünings' idea that the different investigators, when examining their patients by means of identical instruments should thus be able mutually to compare their results, has not been realized, because the different oto-calorimeters allow different amounts of water to pass pr. min. Kobrak's method, though based upon a somewhat altered principle, is subjected to just the same extra-labyrinthine influences as mentioned above, whereby one must draw conclusions as to the degree of irritability by measuring the time of latency after excitation at a low temperature, as compared with the body temperature, which only lasts a short time and thereby acts as weakly excitant; and the weaker the caloric excitation is, the more the extra-labyrinthine conditions influencing the heat conduction will affect the issue. Moreover, using a »Schwachreiz«-method it is of importance that the vestibular apparatus is invariably exposed to an excitant of equal strength; whereas a weak warm-or cold-excitation of a certain strength may definitely cause various reactions, the temperature of the person in question being 36 of 40°. Kobrak[11]), in fact, acknowledges this source of error as being »physiologisch beobachtenswert«, but does not attach any importance to it from a clinical point of view. How he comes to such conclusions I don't know, as the temperature differences in question are so inconsiderable, that even a very slight change as regards the excitant must make itself felt. The same may be said of the other source which causes the committing of errors, in that Kobrak's test can scarcely be performed with sufficient precision as the temperature of the water, when affecting the tymp. mem. has to such a degree, changed according to the ease in which the syringe may be introduced into the ear; this objection is naturally of less significance when one has the necessary practical experience, and also when using water of 13°, such as this method has been modified by others (Demetriades and Mayer). That Kobrak's method in its original form is a great waste of time, theoretically, is of no account if only it were practicable; but those who have tested it declare that it is not suitable for quantitative measuring, a fact which Kobrak, however, himself admits. Evidently great divergencies also manifest themselves among the different authors in respect to the juncture at which the reaction may be said to have set in: Grahe reckons it from the moment bulbi slowly move away from the middle-line; Uffenorde not before nystagmus is plainly present and lasting; Spira demands a nystagmus of 30—100 sec. duration. Such differences as a matter of fact must give greatly diverging results. As already mentioned, it is my opinion that taking into considera-

tion that information regarding the irritability limit can only be obtained when reckoning as positive the sligtest traceable reaction, if only it is reliable, together with very small nystagmus motions, I have reckoned the time of latency from the moment the pupils commence moving, i. e. as G r a h e has it. The reason why the results formerly arrived at are so little satisfactory is undoubtedly, that the principle in measuring the irritability-limit is erroneous. As professor H e n r i q u e s stated in his opposition to an otological dissertation, the irritability must be measured by noting the temperature nearest to the body temperature, just capable of evoking nystagmus; the difference between this and the body temperature is the limit of irritability. This view, when once accentuated, becomes quite evident. In order to grade the irritability it is necessary to find an expression for just the weakest excitant capable of producing reaction. The excitant is of caloric nature, and consequently the question is to find how low the temperature, the effect of which just evokes reaction, differs from the body temperature; in other words, we must measure how many degrees the temperature, which, in effecting the vestibular apparatus, and just producing reaction, differs from the body temperature. And as reaction is brought about by temperatures higher as well as lower than body temperature, it is necessary, in order to procure the exact irritability-limit, to measure the nearest temperature evoking reaction on both sides of the body temperature; and thus it is possible to indicate the limit simply in degrees above or below the latter.

As to my knowledge this matter has not been previously investigated and it was a great surprise to me when commencing these tests to discover, that evidently there was question of very slight differences of temperature, so that I should have to reckon with fractions of degrees.

The first thing I had thus to do was, therefore, to work out a technique which might enable me to grade the temperature of the flush-water very minutely, permitting me to affect the ear for several minutes with a temperature, which in the course of that time did not change one tenth of a degree.

I shall not dwell upon all the matters which during my preparatory experiments proved to influence the temperature of the water, but merely mention that one must make sure of having a completely even flow of water, to avoid loss of heat in the basin, to have the individual in absolutely the same position during the whole test, and the water to flow under exactly the same conditions all the time. Moreover one must, of course, measure the water temperature as close to the ear as possible, in order to prevent any change taking place between the moment of measuring and that of taking effect.

I have formerly (in Passow's Beiträge) described the technique which my different experiments have arrived at, and which has worked satisfactorily. For the sake of completeness I shall give it here.

TECHNIQUES.

The flush-water is obtained by mixing water from two basins, containing respectively cold and warm water. These basins are formed as Mariotte-flasks, in order to make sure that the water flows constantly with the same pressure during the test, and also to prevent changes in temperature, which otherwise might be occasioned by differences in pressure produced in the two basins by alternatively using more water from one than from the other. Both of the two Mariotte-flasks placed on a stand a little higher than the ear passage, contain ca. 15 liters of water of ca. 35° and ca. 45° respectively, and are isolated against loss of heat. (I used hydrophobic wadding for this purpose). From the outlet near the bottom of the bottle the water runs into a rubber tube to a mixing tap, by means of which the temperature of the water can be regulated. From here the water is conducted to the ear through a rubber tube, in which a thermometer, inserted just outside the opening, indicates the temperature at which it affects the ear. The thermometer is fixed in a metal container, through which the water flows in such a way that, by means of a tap (Fig. 2), it can be brought outside the ear until it has reached, and for some time constantly retained the desired temperature, before being conducted to the ear. The terminal, which is passed into the ear passage, is, as in Brünings' oto-calorimeter, a loose capsule, which can be taken off for rinsing in boiling water. The conduct ends in a fine rubber tube (like those used in bicycle valves), which projects from the capsule, and through which the water directly affects the tymp. mem., or the labyrinth wall, and thereupon passes around in the auditory canal, running out through the opening in the capsule, past the fine rubber tube, and through the perforation at B; from where it through a funnel empties into a bucket on the floor. By this arrangement one can avoid affecting the labyrinth with water of a temperature differing too much body temperature and besides making sure that the water actually affects the tymp. mem. and the labyrinth wall. The thermometer must be very sensitive and graded in fifths of degrees, so as to allow the reading of tenths with great accuracy. The entire apparatus is fixed to the patients head by means of leather straps round the forehead and the neck. This proved necessary for the reason

that it was impossible to keep the apparatus so steady in the ear passage as to prevent the temperature of the water, being influenced by the minor changes in the current, liable to occur by involuntary and scarcely noticible movements on the part of the assistant. Moreover, this arrangement permits of performing the test also quite independent of assistance. In order to prevent air from gathering in the metallic capsule I was careful to leave a slight leakage in the packing, allowing thereby the air to escape. It does not matter that a little water comes out through the leakage during the test, but collections of air bubbles on the thermometer may ruin the whole test.

The test it therefore carried out as follows: after having taken rectal temperature with a thermometer that corresponds precisely to the one on the apparatus, the patient is placed in an armchair with adjustable neck support, the head being in optimum-position (measured by means of Brünings' otogoniometer), and the apparatus is applied to the ear. The water is then introduced, after having, to begin with, been allowed to run outside the ear through the tap A, so long until the desired temperature, by using the mixing tap, (Fig. 1) is attained. The Mariotte flasks must be air tight of which one may assure oneself of by listening to the air bubbles mounting in them, and naturally the ear-passage must be entirely free of cerumen and the like, as even small particles may obstruct the passage. One must also examine whether the patient in the given position, and with the apparatus attached to the ear, has spontaneous nystagmus. Through the entire test the individual is provided with Bartels glasses. When the thermometer shows the desired temperature, the cock A is turned off, thus causing the water to flow into the ear, and out at B, and it is observed whether nystagmus appears. As a rule I have let the water run at the same temperature for three minutes, if nystagmus has not set in before, and it is only when nystagmus has failed to appear within three minutes, that I have counted the reaction at a given temperature as 0. Thereupon the temperature is slightly changed, generally $^1/_5{}^0$, and the effect is noted anew. In this way the test is continued until the temperature is found, which just evokes nystagmus. Supposing it is found, for instance, for temperatures below body temperature the temperature is raised until the corresponding one is found that above body temperature evokes the same and consequently the interval between the minimal cold- and warm water irritability is thereby established. The reaction I have in mind is always that noted on glancing forward through Bartels glasses, and in optimum-position, as stated above.

The temperature in the auditory canal has been taken as regards all tested individuals with a pocket thermometer placed in the passage by means of a rubber ring (airtight), but this ear temperature differs notably from the rectal, and it has been proved that it is the latter that is decisive as to reaction. I have, therefore, in the following records of my results omitted the ear-passage temperature, as in my opinion, it is of no account.

Fig. 1.

This test thus gives the interval between the lowest temperature evoking nystagmus above the body temperature, and the highest evoking nystagmus below that of the body, and as the body temperature is known, it expresses the relative irritability of the ear, to cold- and warm excitation respectively. The irritability is simply shewn in degrees or in tenths of degrees (C).

This method must from a purely theoretical point of view seem to be a correct one for measuring the irritability, for thereby the excitation is graded in such a way, that justifies stating that the vestibular apparatus is affected by warm- and cold- excitations approaching the neutral point, by gradually moving from an excitation not sufficiently affecting the vestibular apparatus to induce nystagmus, to one just sufficient to evoke vestibular reaction. At the same time I am of the opinion by this method to have excluded the erroneous inferences that might occur in the previous ones, as it prevents extra-labyrinthine phenomena from influencing the reactions. The fact is that caloric excitation acts for such a long time at each temperature, that the result is independent upon the heat-conductivity, whether it be greater or not. With each temperature is merely noted if nystagmus appears or not, and the period at which the reaction occurs, within the three minutes, I keep the temperature constant, is insignificant in this test; and if as a rule, I have made no efforts to determine it, this must also be due to other circumstances: 1) It is technically very difficult to indicate accurately, at what moment the new temperature, which perhaps may evoke reaction, begins to affect the tymp. mem., or the labyrinth wall, as there are so many other things to note, and, moreover, the temperature is not transferred to the tymp. mem. at the same instant the tap was turned. 2) It is not easy with so delicate nystagmus motions to establish at what moment nystagmus sets in, and far more difficult in fact to determine, whether nystagmus is, on the whole, present. 3) By the minute changes of temperature in question, the greater or lesser heat-conductivity must influence the period of the appearance of the reaction in a so much higher degree than by the methods formerly used, thus in many cases giving a prolonged time of latency, not estimating it correctly.

On the occasion of my preliminary communication, dealing principally with the techniques of my method, Kobrak[11]) has made various objections. By his method he claims to have rendered it possible to distinguish between three factors: the quantity of the flush-water (»Spülmenge«), the temeperature of same, and the time of latency (»Reaktionzeit«), pointing out that he, with regard to the quantity endeavours to make the rate of flushing as regular as possible, at the rate, for instance, of 10 ccm. in 10 sec., in order to make the main factor: flushing-quantity include the value of the temperature's time in taking effect (»Temperaturwirkungzeit«) or the time of irritation. To him the essential factor of the weak-excitation (»Schwachreiz«) is not the weak, but the short irritation, and he states that in my method I set aside two of the three factors only reckoning with the temperature-difference in relation to the blood temperature, and that with the same justification one can regard the »Temperaturwirkungzeit« as the essential factor (»massgebend«). Now, I cannot see but that the temperature's time of affecting by means of Kobrak's method with its subsequent modifications, only contributes to weaken the excitation, as it may

be considered a matter of course that a temperature of, for instance, 27° taking effect in 10 sec. must act as a weaker irritation than the same taking effect in, for instance, 20 sec., merely by the fact that more time is allowed in overcoming the resistance against the change of temperature. Te physical conditions are quite altered in the presence of temperature differing so much from the body temperature as the case is with Kobrak's flushings as compared with those in my method, where the temperature is close to that of the body, and where it is just of importance to be sure that the labyrinth-wall has a staple temperature. With regard to my flushing of the ear, for a longer time during the test, this circumstance is a priori, not likely to influence the result, considering that my temperatures differ so little from the body tem-

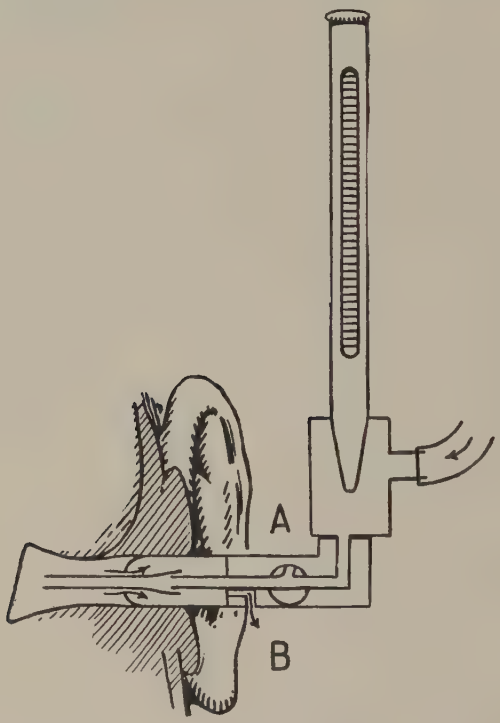

Fig. 2.

perature, and generally are within those not evoking reaction from the vestibular apparatus, returning, as I do, to indifferent temperatures as soon as I have obtained reaction. I have, however, made some test quoted on page 36-38, which show that the temperature's time in taking effect is of no significance in my method. It, in my opinion, merely affords a means of decreasing and increasing the caloric excitation, a means, however, not delicate enough, which is quite comprehensible, when remembering that the question is one of grading into tenths of degress, and at the same time taking into

consideration that he investigations performed at Alexander's clinique (by Demetriades & Mayer), referred to by Kobrak, as proving the practicability of his method, are made by flushing with water of 13°. With the time of latency it is different, as no doubt it is of significance, in many cases, in the judgment of the conditions of the vestibular apparatus that sometimes shews results not agreeing with those of the temperature-measuring method. By my method it cannot be observed; for this purpose probably a shorter and more powerful caloric excitation is necessary such as Kobrak's, or rather Demetriades & Mayer's. Subsequently I shall return to the results I have arrived at concerning this question.

Finally Kobrak objects to my method because of its technical equipment, saying that regarding its practical clinical use it is only suitable for »wirtschaftlich starken Nationen«. This objection is of course of no scientific significance, and even if my apparatus is not within the reach of every physician, the matter is of no importance in any special department, provided the method is the right one. My own apparatus has been procured at very small cost, the hospital engineer having, very willingly, constructed the most essential parts of it. Moreover, a medical practitioner would scarcely feel himself called upon to undertake these more delicate vestibular tests.

PERSONAL EXAMINATIONS OF NORMAL INDIVIDUALS.

To find out the limits, within which irritability manifests itself in sound vestibular apparatuses I have examined 55 normal individuals. By normal, I mean individuals who have never suffered from ear disease, vertigo, or constitutional affections attacking the vestibular apparatus, in particular syphilis. As a rule Wassermann's reaction has not been tested, but I sufficed by ascertaining that anamnestically or objectively there were no symptoms of sickness. Moreover, I have made sure that the tymp. mem. were natural, and the hearing normal, i. e.: > 13 m for whispering. These individuals I have examined both by my method as described above, and by ordinary cold-water flushing with 20° water, using the method generally employed in the otological section of the Rigshospital. The water, 20°, is placed in a basin, the level of which is 25 ctm. above the ear opening of the individual; from this the water flows through a rubber tube ending in a glass terminal 2 mm. in diameter in periphery, and on which a thin rubber tube reaching ca. 1 ctm. over the end, has been fixed. This terminal is provided with a stopper in the shape of a wooden peg, permitting of the point entering only a few ctm. into the ear-passage when pushed against the tragus. During the test the individual is always placed in the optimum position, that is, with the head bent straight back at 60°, and with Bartel's glasses, nystagmus is observed when looking straight ahead and the flushing continued until the moment it sets in. When beginning the flushing a stop-watch is set going, and at the appearance of nystagmus the watch is stopped, the flushing discontinued, and the time elapsed noted. Thereupon the duration of nystagmus is observed by counting the seconds from beginning to end. Furthermore I have measured the amount of water used. In some of the normal individuals I have also made the caloric test a. m. Kobrak, with limited quantities of 35° water, noting both if nystagmus, on the whole appeared, and the number of motions evoked, as well as the time elapsing from commencing the flushing until their appearance. These flushings were performed by means of an ordinary record-syringe, furnished with a thin

rubber tube, and, as far as possible so as to cause the jet of water to strike the tymp. mem. Primarily I shall describe my tests with water of 20°, pointing out that only 48 out of the 55 individuals have been tested in this way. The times of latency measured (that is the time elapsing from the moment flushing is commenced to when nystagmus sets in) vary from 8 to 21 sec.; only one ear, however, showing as long a time of latency as 21 sec., has been noted, none of the rest exceeded 18 sec. The various times are divided as follows: 8 sec. in 3 cases, 9 in 4, 10 in 16, 11 in 11, 12 in 17, 13 in 7, 14 in 9, 15 in 13, 16 in 6, 17 in 6, 18 in 3, 21 in 1 case. Thus it will be seen, that the groups comprising the greatest number of cases lie between 10 and 15 sec.; the average being 12.8 sec. In the material there are 28 women and 20 men, and the time of latency for the former is 12.16 sec. for the latter 13.35 sec., which is in accordance with Boeters, who also found that nystagmus appears more quickly in women than in men, and explains it by saying that the female tissue is more tender and permeable for cold-excitation than the masculine. A comparison of the two sides shows a slightly shorter time of latency in the right side (12.6 sec.) than in the left one (13 sec.), but this difference is so slight, that it scarcely can give rise to any conclusions being drawn. (Barany found by rotation tests, that the right ear was easiest reacting, Boeters the contrary). The duration of nystagmus — i. e. the time from when it sets in, viz: when the flushing is stopped, until the moment no more nystagmus can be observed with certainty — is also measured. I am quite aware that this value is only of lesser import, firstly because it is extremely difficult to determine the moment when nystagmus ceases, and secondly because the excitant which has evoked it, is not equally strong in all cases, the cold-excitation varying from 8—21 sec., and because it is very unlikely, that this difference in strength of the excitant is in direct relation to the degree of excitation necessary for evoking nystagmus. To ascribe any value to the duration of a nystagmus evoked, or to decide whether this figure is of any value the excitant must be the same in all cases, and this is best obtained by flushing a. m. Kobrak. When, nevertheless, I have measured it, the reason is that earlier authors especially just therein suppose to have noted an indication of the value of the irritability (Kiproff, Beck). The duration of nystagmus after flushing with 20° water varies from 85 to 202 sec., thus showing great physiological differences. That my figures are slightly higher than those of Kiproff and Freystadtl (in which the time of flushing is included), is probably due to the circumstance that I have let the individual remain in optimum-position whilst nystagmus ran out. On the other hand they have observed nystagmus whilst the individual looked sideways, whereas I have observed it by looking straight ahead through Bartel's glasses. The generally stated rule, that to a short time of latency a long duration of nystagmus corresponds and vice versa, does not seem, according to my researches, to hold good in reference to normal

vestibular apparatuses as, for instance, the cases having a time of latency of from 8 to 12 sec. incl. have a duration of nystagmus averaging 127.5 sec., whilst those having a time of latency of 13—21 sec. have a duration of nystagmus averaging 133.5 sec. For the right ear the duration averages 129.5 sec., and for the left one 133.3 sec. I have noted the quantity of water in ccm. used at each flushing to evoke nystagmus, but consider this an item of minimal interest, as it is quite accidental whether the water flows somewhat quickly or slowly, according to the ear-passage being wide or narrow, and as circumstances play a so very important rôle in the matter. Even with Brünings' Armantarium the different authors have come to highly divergent figures; I myself have found the quantity of water used to vary from 10 to 65 ccm., averaging 42 ccm.

Using Kobrak's method I have examined 14 normal individuals, and also here observed nystagmus through Bartel's glasses, the individual placed in Brünings' optimum-position. In two of these 28 ears examined, nystagmus was doubtful, whereas the remainder shewed nystagmus of a shorter or longer duration after flushing with 5 ccm. 35° water. When I have obtained nystagmus frequently after using 5 ccm. 35° water, I think it is due to my accounting the reaction as positive even when the motions were but few, if only typical. I am of the opinion, that when there is a question of finding the minimal limit of excitation, it is also necessary to count with minimal motions, if only they are accurate. I have several times, as a matter of fact, reckoned reaction as having taken place, wnen only three typical strokes have occurred. In several cases nystagmus appeared in such a manner that after a relatively short time of latency (for instance 5 sec.) a single stroke occurred after which there was a pause of some seconds, followed by several rhytmical nystagmus motions. At times also the pause after the first motion was again followed by a single stroke, and then a new pause of some few seconds before the setting in of the rhythmic strokes. In such cases I have reckoned the time of latency as the time elapsing until the rhythmical nystagmus sets in. The cases I have examined a. m. Kobrak are: Nos. 2, 17, 24, 25, 28, 30, 31, 32, 34, 35, 38, 39, 42, 46. The times of latency extend from 11 to 28 sec. I have not been able to discover any law-directed relation between the times of latency thus found, using Kobrak's flushings and those arrived at by flushing with 20° water; as a rule the former are somewhat longer than the latter, but in a few cases shorter. The strength of the reaction, measured by the duration of the nystagmus evoked, has varied from 3 motions up to rhythmic nystagmus lasting 30 sec. In some cases shortly after stopping the reaction (45—75 sec. after first flushing) I have repeated flushing of the same ear with 5 ccm. water, and either got reaction where none had occurred after the first flushing, (case 17), or got reaction with a shorter time of latency (cases 28, 35, 46), or with the same (case 28), or with a longer one (cases 32, 35). In these cases, certainly very few,

I have consequently not been able to demonstrate in any formal cases of nystagmus »readiness« (Bereitschaft), as referred to by K o b r a k, according to which one might expect to find the time of latency always considerably shorter after the second flushing than after the first.

I have not tried the modification of Kobrak's method as practised by Demetriades & Mayer, as my researches were brought to end when their material was published.

TESTING OF NORMAL INDIVIDUALS BY THE TEMPERATURE-MEASURING METHOD.

As already mentioned altogether 55 individuals have been examined, and it has proved that in none of these 110 normal vestibular apparatuses tested, the interval between the temperature above the body temperature, at which nystagmus is evoked (in the following briefly called warm-water nystagmus) and the temperature below the body temperature, which likewise evokes nystagmus (called cold-water nystagmus), exceeds 1° C. The smallest total difference between warm- and cold-water nystagmus found is 0°.3, and that in a single case only (51); the greatest difference 1° is found in 4 cases (19, 33, 35, 53). With reference to these total differences, the 110 ears are divided as follows: 0°.3—1 ear, 0°.4—9, 0°.5—7, 0°.6—26, 0°.7—19, 0°.8—35, 0°.9—9, 1°—4 ears. Thus 80 ears, or ca. 73%, have a total difference of between 0°.6 and 0°.8, and the jump as regards the number of cases from these figures to both sides is rather abrupt so that the actual normal value may possibly be still more narrowly limited, i. e. to between 0°.6 and 0°.8. Anything pathological in the individuals here included, showing figures differing of this narrow limit, I have not been able to find, and am therefore obliged, temporarily, anyhow, to count on the possibility, that a normal individual may have an irritability limit just within the demonstrable (which, with my present techniques I must place at 0°.3), up to 1°. The possibility that the comparatively high limiting values 0°.9 and 1°, might relate to elderly people might be advanced, perhaps with a slight commencing atrophy of nervus vestibularis, I have considered, but that is not the case. It is certainly true that there is one of 68 years of age (35), and one 57 year (19), but besides there are several of minor age, i. e., 20 years (45), 23 (8 and 53), 24 (12), 31 (33). Also in cases where the limiting value is less than 0°.6 I have not been able to find anything to justify my regarding them as hyper-irritable. The average limiting value for normal persons is 0°.7; (accurately 0.698°). For the two ears of the same individual the value is not always the same, though as a rule it varies but little, and also in respect hereto the possibility of small inaccuracies, caused by lack of technique must be kept in mind. In 20 individuals exactly the same irritability-limit was

found in the two sides; in 21 the limit was somewhat more as regards the left ear than in the right. The greatest difference between the two sides in the same normal individual was 0°.4, and it was observed in two cases (49, 50), where the right ear shewed 0°.8 and the left 0°.4; in one case (44) the difference was 0°.3 (right ear 0°.7 left 0°.4), otherwise it is 0°.2 or 0°.1. In the 21 cases where the right ear reacts more tardily than the left, the difference averages 0°.16, and in those where the left is the slower in reacting the difference averages 0°.13. The irritability value averages as regards the right ear 0°.71; in the case of the left 0°.68, this thus differs very slightly. I have tried to find out if the age plays any rôle as to the irritability-limit, by placing the individuals in decennial groups, up to 10 years, 21—30, 31—40 years and so forth, but must beg remark that by far the majority (41 out of 55) were under 30 years of age. Both the groups 31—40, and 41—50 years contain only 5, the group 51—60, 3, and that of over 60 years only 1. This single individual over 60 years of age had on the right side the limit 1° and on the left 0°.9, but otherwise no noticable difference in this respect is found within the groups, the limits being on an average for individuals under 20, 0°.66; between 21—30, 0°.74; 31—40, 0°.7; 41—50, 0°.6; 51—60, 0°.75. It is not likely then that in normal individuals the age influences the irritability limit. More marked is the sex influence, as it appears that in men the limit averages 0°.65, while in women it is as high as 0°.72, which does not agree with Boeters' theory according to which a more tender texture should account for the fact that women generally show a shorter time of latency by flushing with 20° water. Why testing with my method shows a slightly finer reaction for men than for women, I shall not attempt to explain. If we take the irritability limit as regards cold and warm water separately, reckoning from the body temperature how many degrees must be reduced in order to evoke cold-water nystagmus, or increased to evoke warm-water nystagmus, it will be seen, that in the first case we, as a rule, must go down to 0°.45, whereas to produce warm-water nystagmus it is sufficient to rise to 0°.25 above body temperature. This difference is so considerable, that it seems that it only can be explained by the theory already set forth by Ewald, that the ampullopetal current in the horizontal archway acts more powerfully than the ampullofugal. It is true, that revising the individual cases we find that in 14, the cold-irritation has a more powerful effect, and that in 25 cases the cold- and warm-irritation act with equal strength, but in 71 of the 110 ears it is a case of the warm-excitation gives reaction at a temperature differing less from the body temperature than the cold, and the difference is, as seen, so pronounced, that the warm-water irritability on an average is about twice that of the cold.

Thornval has (dissertation pag. 89—91) made some tests, exciting the horizontal archway with water at temperatures differing equally from the body temperature above and below. From these tests, which I have mentioned formerly, Thornval concludes

that Ewald's theory in any case does not hold good as regards caloric excitation. Kobrak[9]) has, to refute the physical current-theory, made tests similar to those of Thornval, but with the modification that he uses 5 ccm. flushing. His tests comprise 9 cases, and he states (pag. 4—5), that he has found nothing to prove the law, that the ampullopetal current should act more powerfully than the ampullofugal one. He adds, however, that by flushing one gets, as a rule, a greater effect with warm than with cold water, and at the same time he admits that occasionally he has used such warm water in the flushings, that perhaps the feeling of pain may have acted in such a way as to deaden the reaction, and also that the very limited series of tests does not allow of coming to final conclusions. In some cases I have got nystagmus at a temperature equal to the body temperature. The reason for this may be, that the difference between the temperature excitation evoking warm-water nystagmus, and the body temperature is so little that it cannot be measured by my techniques, it being not likely, as I at first thought (Passow's Beiträge), that the labyrinth, and especially the lateral archway, should have a temperature lower than the rectal.

When considering the irritability-limit for warm and cold water separately, it becomes apparent, however, that the latter is exactly the same for right and left side viz: 0°.45, so that the difference in total irritability existing between the two ears and which is quoted above, depends entirely upon the irritability limit for warm excitation, i. e., 0°.26 for the right, and 0°.23 for the left side, it may thus be possible, that this slight difference is also due to the difficulty in measuring so small values as those in question.

After the publication of Kobrak's theory about nystagmus-»readiness« there is good reason to investigate, whether influences of that kind manifest themselves by examinations of the vestibular apparatus made by my method. One might well expect this, as thereby the ear is being flushed quite a time, and as the flushing with water of the temperature nearest to that of the body, just evoking nystagmus, is not generally effected before the ear has already been exposed to caloric excitation for some time. Thus, if phenomena appeared associated with nystagmus »readiness«, one should find irritability values more narrowly limited than the actual ones, and get the impression that the irritability-limit itself was smaller than what it actually is, which would confine the method to indicating the limit only during nystagmus »readiness«. To examine this question I have made the following tests, in which, I must remark, I have often used individuals from among pathologic cases, as the chance of performing these tests successfully is more likely in case of the irritability-limit not being too narrow. The efficiency of the test as an argument is not thereby shaken.

1). After having first determined the irritability-limit of the individual in the ordinary way, as indicated in the description of my technic, a pause is made. Thereupon the water temperature is adjusted so as to correspond to the one, which at the preceding flushing proved to represent the minimal excitation-limit, and then a new flushing is made. Technically this test is very difficult to perform, as one is rarely able to strike a certain temperature, it being liable to change slightly just at the moment the cock is being turned; however, in some cases I have succeeded, and each time it has turned out that I got exactly the same irritability-limit as at the ordinary test, thus proving that nystagmus »readiness« has no influence on the result.

Case 34, which on the left ear had the limits + 0°.2 and ÷ 0°.5 *) showed after the said proceding, the following day again the limit + 0°.2 for left ear. No. 61 shows on right ear + 0°.4 and ÷ 0°.6, on the left ear + 0°.6 and ÷ 0°.2, and the following day the right ear gives at once reaction at ÷ 0°.6; then a 5 minutes pause is made, after which the right ear again shows reaction at + 0°.4. After a 15 minutes pause the left ear reacts at ÷ 0°.3; then 3 min. pause, but no reaction at + 0°.5; then again 4 min. pause, and reaction is obtained at + 0°.7. No. 130 shows the $^{31}/_{1}$ on right ear the limits + 0°.2 and ÷ 0°.2, on the left ear ÷ 2°.6; the $^{20}/_{2}$ reaction is at once obtained on right ear at + 0°.3, and after pausing 5 min. at ÷ 0°.2; left ear, tested after several minutes pause, shows immediate reaction at ÷ 2°.4, and later during continued examination the limit ÷ 2°.4 is again found unaltered, while ÷ 2°.2 does not give reaction; which, moreover, indicates that symptoms of fatigue are not likely to occur during the test, as the limit remains unchanged without sinking. Sometimes I have been fortunate in immediately on commencing the first test striking the temperature, which subsequently has proved to be the irritability-limit, and also these cases can be pointed to as proofs, that the continuous flushing does not exercise any influence tending to refine or in any other way change the result. No. 60 shows at beginning of the flushing, reaction on right ear at + 0°.5, and at the end of the test again reaction at + 0°.5, but none at + 0°.3. No. 121 on the left ear reaction at + 0°.5 right at the beginning of the flushing and later in the test no reaction at + 0°.3.

*) For the sake of brevity the irritability-limits measured by my method, are termed as, for instance, here: + 0°.2, measuring that the temperature nearest to the body temperature which evokes nystagmus lies 0°.2 above this. Likewise ÷ 0°.5 means that the temperature nearest below the body temperature evoking nystagmus is found to be 0°.5 below it. Thus when it is said that the limits are + 0°.2 and ÷ 0°.5, this means that reaction sets in at temperatures differing upwards 0°.2 and downwards 0°.5 from the body temperature, but that within these temperatures no reaction appears. The interval between them is called the neutral zone.

2). One might also expect to get information as to whether nystagmus »readiness« occurred in consequence of continuous flushing by testing for vestibular reaction with Kobrak's 5 ccm. flushing, both before and immediately after examining by my method, and then measuring if any change had taken place. Accordingly if a nystagmus »readiness« had been produced by the continuous flushing, then the flushing with 5 ccm. water immediately after would give a greater reaction than what it was previous to the continuous flushing; but that does not happen. In No. 28 5 ccm. 35° water gives before the continuous flushing reaction on left ear after 15 sec., and after same a reaction after 16 sec. No. 48 gives for 10 ccm. 35° water reaction on left ear after 36 sec. before, and exactly the same after, when again flushed with 10 ccm. 35° water. Likewise in No. 135 5 ccm. 35° water gives reaction on left ear after 35 sec. before and the same excitant reaction after 40 sec. immediately after the continuous flushing.

3). For one instance (No. 2) after first having determined the irritability-limit by flushing with 5 ccm. 35° water, I have made a test by simultaneously flushing one ear again with 5 ccm. 35° water and the other by my method with a temperature lying in the neutral zone. Previous to the continuous flushing the 5 ccm. 35° water shewed doubtful reaction on the right ear, and reaction after 18 sec. on the left. During the continuous flushing reaction could not be evoked from either ear by flushing with 5 ccm. 35° water; immediately after flushing the left ear it was flushed again with 5 ccm. 35° water, and a trace of reaction appeared after 19 sec.

By these tests I opine to have proved that the results of my investigations are not influenced by the circumstance that the irritability-limit is being determined only after a certain time of flushing, such as is the case with my method, as no displacements of the limits can be indicated in consequence of nystagmus »readiness« or fatigue phenomena.

I shall briefly mention some tests I have made with a view of determining whether the irritability-limit measured by my method, becomes affected by interferences of different kinds, which I might anticipate could have the effect of checking the reaction. In three cases (Nos. 1, 26, 38) I have tested whether administering of morphia had such an influence, proceeding in that way that, after having examined the said individuals I gave them an injection chloreti morphici of 1—1.5 Ctgr., and then repeated the test after the lapse of ½—1 hour. It was proved then that in all three cases the reaction occurred at the same values as previous to the injection, and in one case the limit was even somewhat finer, because the individual was calmer and more easy to observe.

In two cases (60 and 85 b) with cavity after radical-operation

the labyrinth wall was anaesthetised by means of cocaine or cocaine-adrenaline, but the irritability-limits were the same as before the anaesthesia. Kubo has by administering cocaine to rabbits also found the caloric reaction as unchanged as before the injection. In one case (No. 78) the labyrinth wall was treated with adrenaline only, with the result that the limits, which previously were + 0°.3 and ÷ 0°.3, after the adrenalin-effect were + 0°.2 and ÷ 0°.3, thus also almost unchanged. Once I have anaesthesised the tympanic membrane with novocain-adrenal-infiltration (163), and the limits were respectively + 0°.2, ÷ 1°.8, and + 0°.2, ÷ 2°.1 before and after, also essentially unchanged. As I had to interrupt this test before having precisely determined the lower limit, it is possible that the limits lie still nearer to each other before and after the test.

It will be seen that by the tests described I have not been able essentially to affect the excitation.

In several different ways I have tried to combine the varying values resulting from testing normal individuals, in order to establish if any law-directed relation exists between them, so that, knowing one of them, it might be possible therefrom to draw approximate conclusions as to all, or at least to some of the others. With this in view I have made curves in order to compare:

1) time of latency measured by flushing with 20° water
2) duration of nystagmus after flushing with 20° water
3) time of latency measured after flushing a. m. Kobrak
4) complete irritability-limit measured by my method
5) irritability-limit for cold-excitation measured by my method.

As I have formerly stated in normal individuals no law-directed relation seems to exist between the time of latency measured by flushing with 20° water, and the duration of the hereby evoked nystagmus. The remainder of the curves are of no interest, as I have not succeeded in establishing any clearly expressed proportion between the different values. Only between the time of latency measured by flushing with 20° water, and the irritability-limit for cold-excitation measured by my method, there is a parallelisme — though only fair. When taking the different times of latency, and calculating the average values of the corresponding irritability-limits for cold-excitation, or vice versa, the representing curves will then show pretty evenly, although not in a quite regular course. As, for instance, time of latency 8 sec. corresponds to irritability-limit for cold-excitation 0°.26, 9 sec. to 0°.3, 10 sec. to 0°.45, 11 sec. to 0°.44, 12 sec. to 0°.41, 13 sec. to 0°.45, 14 sec. to 0°.50, 15 sec. to 0°.44, 16 sec. to 0°.47, 17 sec. to 0°.50, 18 sec. to 0°.57; i. e. the curve of time of latency is followed by the curve of irritability-limit for cold-excitation only approximately regularly.

Other coordinations have produced rather confused results, so I shall not dwell upon them.

That it is possible to evoke caloric reaction with temperatures differing so little from that of the body as to involve tenths of degrees (C.) surprises at first sight, and it might seem impossible with so small temperature-excitations to produce endolymph-currents, especially when considering that the excitation most often affects a spot rather remote from the labyrinth wall, which, moreover, impairs the effect. At any rate one might beforehand feel inclined to believe that the direct warm- and cold-excitation on the archway was so little, that it would not be able to bring about a change in temperature of the endolymph, sufficient to induce currents by means of direct refrigeration or heating. Meanwhile Maier & Lion have made some test partly on pigeon archways, partly by using capillary-tubes imitating archways, and shown that by temperature excitations not differing more than 0°.5 from the temperature of the endolymph, or the fluid contained in the capillary tubes, distinct currents, directly visible microscopically, were produced in the fluid. Thus the possibility of evoking nystagmus with so small temperature excitations as I have found, by no means tells against the theory set forth by Barany in explaining the origination of the caloric reaction.

As stated above I am at present of the opinion that the limiting of normal irritability as established by the temperature-measuring method, must be from the just traceable up to 1° C. Dealing with my normal cases I have quoted that the actual limit is possibly somewhat narrower, but at present I don't feel justified in reckoning with a more restricted limit, as I have not been able to demonstrate anything abnormal with those individuals, with whom the limit lay within 1°. Any absolute measure for the irritability, in respect to cold and warm excitation separately, can scarcely be laid down, because the irritability in normal individuals shows a fluctuating tendency, it being more noticable sometimes for warm and sometimes for cold-excitation; however, this, as a rule, is finest for warm excitation, averaging twice as much for cold. When, therefore, using the temperature-measuring method I am to consider a case as pathological, I must count with the total irritability, and not before this exceeds 1° (C.), the irritability is considered as reduced. I must here accentuate, that some of the pathological

cases tested, imagining them to be normal, shew abnormal reactions, and that an accurate and more minute examination proved the existence of abnormities, as for instance, a positive Wassermann reaction in some few cases. As it will appear from the results of my examinations of normal individuals, the pathologic deviations always consist of a reduction of the irritability, as a reaction hardly can be finer than what I have found in several of my normal cases. According to my experience dizziness most often arises from a reduction of irritability, and Brünings already in 1911 writes that one must be very cautious in speaking of hyper-irritability as attacks of dizziness may as well be due to a hypo-irritability;in fact he is of the opinion only in very few cases to have been justified in speaking of an actual hyper-irritability. Zalewski expresses himself in a similar way, and Baldenweck's investigations on mb.meniere points in the same direction. At any rate it seems advisable, in cases where there is no spontaneous nystagmus, to be cautious in diagnosing hyper-irritability. Alexander and Brunner have recently taken up the question of labyrinthine hyper-irritability and are of the opinion that the diagnosis labyrinthine hyper-irritability on account of vertigo in the anamnesis, spontaneous nystagmus (in any case periodically) and shortened time of latency may be given. The ratio between time of latency and irritability will be enlarged upon later.

I have thus never been able to indicate actual hyper-irritability. Reduction of irritability of course varies greatly according to the severity of the cases. In my material there are cases just approaching the normal and others where I have not been able to measure exactly the reduction, as it is hardly practicable to flush with water of more than 48°, whereas the cold irritation may go right down to 0°, thus affording a possibility of diverging from body temperature more in a cold than in a warm direction. To conclude as to the reduction of the irritability for the one caloric quality to that of the other is not possible, as the two values by no means agree; nay, in a great many cases the irritability is changed exclusively as regards one of the caloric qualities, whilst the other one shows seemingly normal figures. This is no doubt a matter of great importance. Demetriades & Mayer go as far as to say that warm-water flushing is superfluous in the diagnosis, and leave it therefore out of consideration. At any rate the irritability for the two caloric qualities are partly independent of each another. The explanation may be that the nervous conduction of warm and of cold impressions follow different courses, so that there might be a question of the vestibular apparatus having a kind of temperature-sense, but this hardly agrees with Barany's endolymph-current theory. More likely it might be explained thereby, that the bending of the cupula-hairs is easier in one direction than in the other, or rather that the nerves get more easily affected by the hairs bending one way than the other. For whatever reason it may be the, irritability for warm- and cold-excitation respectively it affected differently, and even independently of one another.

Cases where only the warm-irritability are concerned.

No. 59 (otitis chr. sin.), 4 months dizziness.

$\frac{+\,0°.2 \div 0°.4}{+\,1°.0 \div 0°.4}$, 20° water $\frac{25\text{ sec.}}{25\text{ sec.}}$ rot. test. $\frac{25\text{ sec.}}{35\text{ sec.}}$

Flushing with 20° water and the rotation not done by me, the patient being discharged on account of insanity.

No. 63 (otitis dupl.) only a little dizzy on the way to the hospital, otherwise no dizziness.

$\frac{+\,1°.2 \div 0°.4}{+\,0°.2 \div 0°.8}$, 20° water $\frac{10\text{ sec. dur. }155\text{ sec.}}{15\text{ sec. dur. }132\text{ sec.}}$. rot. $\frac{20\text{ sec.}}{15\text{ sec.}}$

Flushing with 20° water shows nothing abnormal. The rotatory test almost indicates a reduction of irritability of the left side, whereas the temperature-measuring method shows abatement as to warm-irritability on right, whilst abatement of cold-irritability on left side is doubtful.

No. 66 (otitis dupl. seq. Neurit. acust dupl.? in pr. sin.) never dizziness.

$\frac{+\,2°.3 \div 0°.5}{+\,0°.3 \div 2°.0}$, 20° water $\frac{20\text{ sec. dur. }110\text{ sec.}}{22\text{ sec. dur. }95\text{ sec.}}$. rot. $\frac{25\text{ sec.}}{25\text{ sec.}}$

Right ear which is accoustically the less affected proves by the vestibular test to be the only abnormity i. e. a reduction for warm-excitation in a rather high degree. Left ear, accoustically much more affected, shows on the contrary normal warm-irritability. whereas the cold-irritability is proportionately abated. The time of latency on flushing with 20° water shows quite high values for both ears; on right side, however, within the normal figures, whereas left side surpasses them somewhat. Taking all into consideration it does not seem likely that, with the ordinary test, one would have suspected the vestibular apparatus being affected.

No. 69 (otitis sin.) in left ear a granulation-covered labyrinth wall.

$\frac{+\,0°.4 \div 0°.4}{+\,0°.8 \div 0°.3}$, 20° water $\frac{25\text{ sec.}}{45\text{ sec.}}$. rot. $\frac{23\text{ sec.}}{16\text{ sec.}}$

That the time of latency is so long on left side may well be due to the granulations on the labyrinth wall. The rotation proves a disease, at any rate, in left ear. The temp.-meas. method shows an isolated reduction of irritability for warm-excitation on left ear. The prolonged time of latency for right ear is probably due to there being residua after suppuration, in form of retracted drum membrane and small dry perforation.

No. 75 (otitis chr. dx., seq. otitis sin.) a. d.: thickering of the tympanic membrane, oval perforation, labyrinth wall reflecting; a. s.: central perforation, much thickened, labyrinth wall pale.

$\frac{+\ 0°.9 \div 0°.3}{+\ 0°.2 \div 0°.2}$. 20° water $\frac{23 \text{ sec.}}{30 \text{ sec.}}$. rot. $\frac{18 \text{ sec.}}{25 \text{ sec.}}$

The flushing with 20° water apparently points to a reduction of irritability on left ear, if after all one may draw conclusions as to quantitative modifications of the irritability in presence of such great changes in the tympanic membrane as in this case. The rotatory test apparently points to abatement on right ear. The temperature-measuring method shows an isolated reduction of the caloric irritability for warm-excitation.

No. 79 (seq. operat. radical. dex.) a. d.: some pus from the radical-operation cavity; a. s.: natural. Operated 7 months ago. During the last fourteen days vaguely characterized heaviness in the head, and dizziness.

$\frac{+\ 0°.1 \div 0°.7}{+\ 1°.5 \div 0°.1}$. 20° water $\frac{5 \text{ sec. dur. } 114 \text{ sec.}}{17 \text{ sec. dur. } 130 \text{ sec.}}$. rot. $\frac{35 \text{ sec.}}{40 \text{ sec.}}$

The test with 20° water shows very short time of latency on right ear on account of the radical operation, whereas the rotatory test shows normal figures. Perhaps the dizziness can be explained by some lesion which exclusively manifests itself therein that the warm-irritability is abated on left ear, which in the other tests else shows normal conditions.

No. 84 (seq. operat. radical. sin.) a. d.: natural, a. s.: partly granulating radical cavity. Previous to operation sometimes dizziness.

$\frac{+\ 0°.2 \div 0°.2}{+\ 0°.8 \div 0°.3}$. 20° water $\frac{11 \text{ sec. dur. } 128 \text{ sec.}}{7 \text{ sec. dur. } 142 \text{ sec.}}$. rot. $\frac{25 \text{ sec.}}{28 \text{ sec.}}$

Left side's very short time of latency is due to the operation. Only the reduction of the irritability for warm-excitation on left side shows that the vestibular apparatus is affected.

No. 90 (syphilis) drum membrane natural. No dizziness.

$\frac{+\ 1°.4 \div 0°.3}{+\ 0°.4 \div 0°.4}$. 20° water $\frac{15 \text{ sec. dur. } 140 \text{ sec.}}{16 \text{ sec. dur. } 142 \text{ sec.}}$. rot. $\frac{31 \text{ sec.}}{35 \text{ sec.}}$

Only abatement of warm-irritability indicates an affection of the vestibular apparatus.

No. 106 (syphilis 1879). Wassermann now negative; for ca. 10 days dizziness. Tympanic membrane natural. Hearing is much impaired on both ears, mostly resembling a neuritis acust.

$\frac{+\ 0°.4 \div 0°.5}{+\ 1°.0 \div 0°.3}$. 20° water $\frac{15 \text{ sec. dur. } 171 \text{ sec.}}{12 \text{ sec. dur. } 238 \text{ sec.}}$. rot. $\frac{31 \text{ sec.}}{32 \text{ sec.}}$

The only thing remarkable with the ordinary vestibular test is the long duration of caloric nystagmus on left side. The tem-

perature-measuring method shows abatement of caloric warm- irri-tability.

No. 127 (syphilis). Tymp. mem. natural. Hearing sense natural. Increase of cells in cerebro-spinal fluid.

$\frac{+ 1°.5 \div 0°.3}{+ 0°.1 \div 2°.0}$. 20° water $\frac{14 \text{ sec. dur. } 120 \text{ sec.}}{17 \text{ sec. dur. } 125 \text{ sec.}}$

47° water $\frac{22 \text{ sec. dur. } 80 \text{ sec.}}{27 \text{ sec. dur. } 95 \text{ sec.}}$. rot. $\frac{12 \text{ sec.}}{15 \text{ sec.}}$

The rotatory test indicates existance of some abnormity of the vestibular apparatus. Ordinary flushing both with warm and with cold water shows longer time of latency for left than for right ear, without giving certain evidence, however, of any pathological condition; the temp.-measuring method shows an isolated reduction of warm-irritability on right, and of cold-irritability on left ear.

No. 134 (syphilis). Tymp. mem. natural. Vertigo at outbreak of the disease (½ year ago).

$\frac{+ 1°.2 \div 0°.8}{+ 0°.4 \div 0°.8}$. 20° water $\frac{10 \text{ sec. dur. } 128 \text{ sec.}}{14 \text{ sec. dur. } 118 \text{ sec.}}$

rot. $\frac{\div}{\div}$. 5 ccm. 35° $\frac{15 \text{ sec.}}{16 \text{ sec.}}$

Rotation points decidedly to a disease in vestibular apparatus; the ordinary caloric tests to nothing abnormal. The temp.-meas. method shows on the right side a dubious reduction of cold and an undoubted reduction of warm-irritability. On left side the total irritability-limit is abnormal, and it is not sure, whether the reduction is due to the one quality or to the other.

No. 142 (syphilis). Tymp. membrane and hearing normal.

$\frac{+ 1°.1 \div 0°.3}{+ 1°.1 \div 0°.3}$. 20° water $\frac{16 \text{ sec. dur. } 112 \text{ sec.}}{15 \text{ sec. dur. } 110 \text{ sec.}}$. rot. $\frac{26 \text{ sec.}}{25 \text{ sec.}}$

No sign of disease in vestibular apparatus except the bilateral reduction of irritability for warm excitation.

No. 150 (Mb. meniere). Tymp. mem. natural. Hearing impaired on right ear, almost natural on the left.

$\frac{+ 1°.4 \div 0°.4}{+ 0°.3 \div 1°.1}$. 20° water $\frac{13 \text{ sec. dur. } 128 \text{ sec.}}{10 \text{ sec. dur. } 143 \text{ sec.}}$

5 ccm. 35° $\frac{20 \text{ sec.}}{27 \text{ sec.}}$. rot. $\frac{40 \text{ sec.}}{45 \text{ sec.}}$

Of all the vestibular tests, it is only the temp.-meas. method which indicates the existance of pathological conditions. On the more affected ear (in acoustic sense) it manifests itself exclusively in a reduction of the irritability for warm-excitation, whilst on the

other ear it is shown by abatement of the irritablity for cold-excitation. The reduction is most pronounced on the ear acoustically more affected.

No. 159 (otosclerosis, menieriforme accesses). Tymp. membranes dull. Hearing reduced on left ear.

$\frac{+\ 0\,^{\circ}.5 \div 0\,^{\circ}.2}{+\ 1\,^{\circ}.2 \div 0\,^{\circ}.7}$. 20° water $\frac{12 \text{ sec. dur. } 130 \text{ sec.}}{22 \text{ sec. dur. } 100 \text{ sec.}}$. rot. $\frac{26 \text{ sec.}}{22 \text{ sec.}}$

Here all tests point to a disease of left labyrinth; the temp.-meas. method shows that the affection, as to caloric excitation, manifests itself by the irritability being abated for warm excitation.

No. 160 (Mb. meniere). Tymp. mem. natural. Hearing reduced on left ear.

$\frac{+\ 0\,^{\circ}.2 \div 0\,^{\circ}.2}{+\ 1\,^{\circ}.4 \div 0\,^{\circ}.4}$. 20° water $\frac{12 \text{ sec. dur. } 131 \text{ sec.}}{13 \text{ sec. dur. } 134 \text{ sec.}}$. rot. $\frac{26 \text{ sec.}}{34 \text{ sec.}}$

It is exclusively the reduction of the warm-irritability on the sick left ear, that shows affection of the vestibular apparatus.

No. 162 (neurit. acust., mb. meniere? seq. otit. supp. dupl.) Slight dry perforation on both tymp.-membranes. Hearing much reduced on both sides; likely of nervous type.

$\frac{+\ 1\,^{\circ}.1 \div 0\,^{\circ}.7}{+\ 1\,^{\circ}.2 \div 0\,^{\circ}.9}$. 20° water $\frac{24 \text{ sec. dur. } 92 \text{ sec.}}{13 \text{ sec. dur. } 138 \text{ sec.}}$. 5 ccm. 30° $\frac{21 \text{ sec.}}{21 \text{ sec.}}$ rot. $\frac{38 \text{ sec.}}{32 \text{ sec.}}$

By flushing with 20° water a prolonged time of latency is found; but as anatomic changes in the middle ear, caused by the previous inflammations, must be taken into account, one cannot attach importance thereto. The reduction of the irritability, ascertained by the temp.-meas. method, which principally shows the warm quality affected, indicates with certainty that the vestibular apparatus is affected.

No. 168 (neurit. acust.?). Tymp. mem. natural. Hearing normal, only the bone-conduction shortened on both sides. Weber to left. On glancing to left, nystagmus to left, otherwise no nystagmus. Never dizziness.

$\frac{+\ 2\,^{\circ}.1 \div 0\,^{\circ}.1}{+\ 0\,^{\circ}.5 \div 0\,^{\circ}.7}$. 20° water $\frac{14 \text{ sec. dur. } 107 \text{ sec.}}{12 \text{ sec. dur. } 115 \text{ sec.}}$

A very slight neurit. acust. which never has given symptoms of any sort, and which, according to the acoustic examination, is most pronounced on right side. Perhaps the affection originates from an attack of »flu« dating three years back. The temp.-meas. method indicates a bilateral affection of the vestibular apparatus, most pronounced on right side; and here exclusively the warm quality is affected.

No. 176 (neurit. acust?). Tymp. mem. natural. Hearing slightly impaired on right ear. Bone-conduction shortened on both ears. Influenza three years ago. Never dizziness.

$\frac{+1°.4 \div 0°.4}{+0°.5 \div 0°.5}$. 20° water $\frac{19 \text{ sec. dur. } 75 \text{ sec.}}{8 \text{ sec. dur. } 74 \text{ sec.}}$. rot. $\frac{17 \text{ sec.}}{17 \text{ sec.}}$

5 ccm. 35° water $\frac{\div}{17 \text{ sec.}}$. 10 ccm. 35° water $\frac{19 \text{ sec.}}{}$

On flushing with 20° water a considerably shorter time of latency is obtained for left than for right ear, both values within the physiological limits, however. The rotation indicates decidedly pathological values. Flushing with 35° water shows a weaker irritability for right than for left ear, but not truly pathological. The temp.-meas. method shows a deciedd reduction on right ear, exclusively confined to effect of warm excitation.

No. 177 (vertigo). Tymp. mem. slightly retracted. Hearing natural. Dizziness when moving the head.

$\frac{+1°.2 \div 0°.2}{+0°.4 \div 0°.2}$. 20° water $\frac{17 \text{ sec. dur. } 114 \text{ sec.}}{13 \text{ sec. dur. } 126 \text{ sec.}}$. rot. $\frac{46 \text{ sec.}}{42 \text{ sec.}}$

The isolated abatement of the irritability for warm excitation on right side suggests that the vertigo, in spite of the negative indications of the ordinary tests, is of vestibular origin.

No. 181 (vertigo, psychastenia). Tymp. membranes somewhat dull, hearing normal.

$\frac{+2°.6 \div 0°.4}{+0°.2 \div 2°.5}$. 20° water $\frac{25 \text{ sec. dur. } 120 \text{ sec.}}{20 \text{ sec. dur. } 100 \text{ sec.}}$. rot. $\frac{32 \text{ sec.}}{35 \text{ sec.}}$

Flushing with 20° shows a pathologic time of latency for right ear; for left it is just on the limit. The temp.-meas. method shows an isolated reduction of the irritability for warm-excitation, left ear the same for cold-excitation.

RELATION BETWEEN TIME OF LATENCY AND IRRITABILITY-LIMIT.

In this coordination I have not included the cases with suppuration or residua thereof, because the time of latency under these conditions is influenced by strange (extra-labyrinthine) factors to such a degree, that with such sufferings I am not of the opinion that I can find material suitable for just valuation. There is therefore a question of patients suffering from syphilis, mb. meniere, neuritis acustica, vertigo, sq. labyrinthitidis and the like.

Construction of curves for the average values of the irritability limits corresponding to the different times of latency does not give any true impression of the incongruities existing between these values. I have therefore preferred to go through some of the cases with reference to the relation between time of latency and irritability limit, with a view of giving an impression of how often these values do not correspond, and how it is possible by the temperature-measuring method to determine disturbances of the irritability, the time of latency of which does not give any indication.

No. 89.

20° water $\frac{15 \text{ sec.}}{20 \text{ sec.}}$. rot. $\frac{39 \text{ sec.}}{55 \text{ sec.}}$. temp. meas. $\frac{+ 1°.3 \div 0°.3}{+ 0°.5 \div 1°.1}$

Hearing normal, only the bone-conduction shortened; this being the only abnormity besides shewn by the temp.-meas. method.

Nr. 90.

20° water $\frac{15 \text{ sec.}}{16 \text{ sec.}}$. rot. $\frac{31 \text{ sec.}}{35 \text{ sec.}}$. temp. meas. $\frac{+ 1°.4 \div 0°.3}{+ 0°.4 \div 0°.4}$

Hearing is normal.

Nr. 91.

20° water $\frac{13 \text{ sec.}}{12 \text{ sec.}}$. rot. $\frac{20 \text{ sec.}}{20 \text{ sec.}}$. temp. meas. $\frac{+ 0°.5 \div 1°.7}{+ 0°.3 \div 1°.7}$

Hearing normal; the figures of the rotatory test are here very low and possibly pathological, but time of latency shows nothing abnormal.

Nr. 92.

20° water $\frac{20 \text{ sec.}}{22 \text{ sec.}}$. rot. $\frac{14 \text{ sec.}}{5 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.5 \div 1^{\circ}.7}{+0^{\circ}.8 \div 1^{\circ}.9}$

Hearing natural, only the bone-conduction on left ear somewhat reduced. The rot. here pathological, but time of latency shows natural figures.

No. 94.

20° water $\frac{14 \text{ sec.}}{13 \text{ sec.}}$. rot. $\frac{22 \text{ sec.}}{10 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.5 \div 0^{\circ}.3}{+0^{\circ}.2 \div 1^{\circ}.1}$

Hearing natural; rot. indicates a vestibular affection, while time of latency shows nothing.

No. 102.

20° water $\frac{9 \text{ sec.}}{16 \text{ sec.}}$. rot. $\frac{20 \text{ sec.}}{22 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.2 \div 0^{\circ}.3}{+0^{\circ}.3 \div 1^{\circ}.5}$

Hearing natural; bone-conduction slightly shortened, mostly on right side; this and the short time for rotation points to something pathological, whilst the time of latency shows nothing.

No. 105.

20° water $\frac{17 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{24 \text{ sec.}}{27 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.1 \div 0^{\circ}.2}{+0^{\circ}.2 \div 1^{\circ}.2}$

Hearing natural. The short after-nystagmus by the rotation looks suspicious; time of latency natural.

No. 113.

20° water $\frac{12 \text{ sec.}}{16 \text{ sec.}}$. rot. $\frac{26 \text{ sec.}}{35 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.8 \div 1^{\circ}.4}{+1^{\circ}.0 \div 0^{\circ}.7}$

Hearing natural. Here only the temp. meas. method indicates a disease in the vestibular apparatus.

No. 119.

20° water $\frac{11 \text{ sec.}}{13 \text{ sec.}}$. rot. $\frac{41 \text{ sec.}}{47 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.4 \div 0^{\circ}.4}{+0^{\circ}.2 \div 1^{\circ}.0}$

Only temp. meas. shows something abnormal.

No. 120.

20° water $\frac{12 \text{ sec.}}{17 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.4 \div 1^{\circ}.0}{+0^{\circ}.4 \div 1^{\circ}.6}$

Impaired hearing on left ear with shortened bone-conduction on both; result of rotatory test unfortunately not noted in this case.

No. 122.

20° water $\frac{15 \text{ sec.}}{16 \text{ sec.}}$. rot. $\frac{45 \text{ sec.}}{38 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.5 \div 1^{\circ}.8}{+0^{\circ}.5 \div 1^{\circ}.2}$

Hearing natural; bone-conduction reduced somewhat; suffers from temple headache and some dizziness; time of latency and rotation shows nothing to indicate affection of vestibular apparatus.

No. 127.

20° water $\frac{14 \text{ sec.}}{17 \text{ sec.}}$. rot. $\frac{12 \text{ sec.}}{15 \text{ sec.}}$. temp. meas. $\frac{+1^{\circ}.5 \div 0^{\circ}.3}{+1^{\circ}.0 \div 2^{\circ}.0}$

Hearing natural. The short after-nystagmus after rotation indicates an affection in the vestibular apparatus, whereas the time of latency shows nothing pathological.

No. 130.

20° water $\frac{12 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{23 \text{ sec.}}{32 \text{ sec.}}$. temp. meas. $\frac{+1^{\circ}.2 \div 0^{\circ}.2}{+1^{\circ}.2 \div 2^{\circ}.4}$

Total deafness on left ear; rotation not showing anything certain; time of latency nothing abnormal, but the temp. meas. method shows that also left side nervus vestibular is affected.

No. 134.

20° water $\frac{10 \text{ sec.}}{14 \text{ sec.}}$. rot. $\frac{\text{no nyst.}}{\text{no nyst.}}$. temp. meas. $\frac{+1^{\circ}.2 \div 0^{\circ}.8}{+0^{\circ}.4 \div 0^{\circ}.8}$

A case of so-called dissociation. The temp. measuring method shows affection of vestibular apparatus, sensitive also to caloric excitation, whereas time of latency shows nothing.

No. 139.

20° water $\frac{9 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{24 \text{ sec.}}{31 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.6 \div 0^{\circ}.6}{+0^{\circ}.4 \div 1^{\circ}.4}$

Hearing natural; bone-conduction some shortened, mostly on left side; only the temp. meas. method shows that the vestibular apparatus is affected.

No. 142.

20° water $\frac{16 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{26 \text{ sec.}}{25 \text{ sec.}}$. temp. meas. $\frac{+1^{\circ}.1 \div 0^{\circ}.3}{+1^{\circ}.1 \div 0^{\circ}.3}$

Hearing natural.

There is no need to go through more cases. I shall merely state that in the following cases identical conditions are forthcoming, namely that the time of latency shows normal figures, whereas the temp. meas. method indicates an affection of vestibular apparatus, viz: Nos. 149, 150, 151, 154, 155, 157, 160, 166, 168, 171, 172, 174, 175, 176, 177, 182, 188.

Thereafter I shall mention some few cases, where the time of latency is abnormally short.

No. 163.

20° water $\frac{3 \text{ sec.}}{10 \text{ sec.}}$. rot. $\frac{22 \text{ sec.}}{25 \text{ sec.}}$. temp. meas. $\frac{+0^{\circ}.2 \div 1^{\circ}.8}{+0^{\circ}.0 \div 1^{\circ}.8}$

Hearing natural; bone-conduction shortened somewhat; suffering from dizziness and tingling in right ear. The rotatory test apparently points to a reduction of the irritability, whereas the very short time of latency (nystagmus setting in as regards some of the tests almost instantaneously at the beginning of the flushing) must rather be interpreted as a sign of hyper-irritability. The temp. meas. test decidedly indicates a checking of the function, as the irritability-limit is considerably lowered.

No. 166.

20° water $\frac{6 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{35 \text{ sec.}}{32 \text{ sec.}}$. temp. meas. $\frac{+0°.8 \div 0°.2}{+0°.6 \div 0°.6}$

The patient suffers from dizziness and bilateral hardness of hearing (neurit. acust?). In the cerebro-spinal fluid $^{28}/_{3}$ cells; otherwise no symptons of tumor or dementia paralytica. Wassermann negative. Rotation does not show any sign of hyper-irritability. The temp. meas. test shows on the right ear, which has the short time of latency, the irritability-limit 1°.0, i. e. the extreme normal limit; on left ear a slight reduction.

No 179.

20° water $\frac{12 \text{ sec.}}{5 \text{ sec.}}$. rot. $\frac{37 \text{ sec.}}{38 \text{ sec.}}$. temp. meas. $\frac{+0°.3 \div 0°.2}{+0°.4 \div 0°.2}$

Five years, one year, and three days ago, single attacks of vertigo. Hearing natural, bone-conduction, however, slightly reduced. Spontaneous fall to right not depending upon head-position; difficulty in speaking, neurologic diagnosis uncertain; cerebro-spinal fluid normal.

Within the groups of diseases above named I have cases with prolonged time of latency (viz: more than 21 sec.) of 26 ears, of which 20 in accordance herewith show reduction of the irritability limit when tested with the temperature-measuring method; whereas the 6 of them show normal values. These 6 cases I shall still briefly enlarge upon.

Nos. 124 and 128, both syphilis. Flushing with 20° water gives for time of latency respectively $\frac{21 \text{ sec.}}{22 \text{ sec.}}$ and $\frac{22 \text{ sec.}}{20 \text{ sec.}}$, figures lying close to the normal limit; the rest of the testing does not show anything absolutely abnormal. Maybe in No. 128 after-nystagmus by rot. test is rather short, althoug it cannot with certainty be considered as pathological. The irritability-limit is in No. 124 absolutely normal. With No. 128 the limit on right ear, where the time of latency is prolonged, shows just the highest normal figure, 1°. As the values in both these two cases just touch the extreme normal limit, it is difficult to draw exact conclusions from the results.

No. 101 shows by flushing with 20° water the times of latency $\frac{27 \text{ sec.}}{26 \text{ sec.}}$. The temp. meas. method gives normal figures, but here it is expressly noted that the patient's ear-passages are somewhat narrow, which very likely may have influenced the time of latency by prolonging it, and such a case can therefore be counted among those, where the time of latency is affected by obvious extra-labyrinthine conditions.

No. 86 (syphilis) shows normal hearing, shortened bone-conduction.

Time of latency $\frac{16 \text{ sec.}}{24 \text{ sec.}}$. rot. $\frac{20 \text{ sec.}}{40 \text{ sec.}}$. temp. meas. $\frac{+ 0°.7 \div 0°.5}{+ 0°.1 \div 0°.1}$

i. e. normal irritability-limit on left ear corresponding to the prolonged time of latency, while on right side, where it is normal, the irritability-limit is found reduced, in accordance with the shortened rotatory after-nystagmus. Both methods of testing by caloric excitation here point to some abnormal condition, and this opinion I find supported by the rotatory test.

No. 116 has time of latency $\frac{20 \text{ sec.}}{30 \text{ sec.}}$. rot. $\frac{30 \text{ sec.}}{22 \text{ sec.}}$. Temp. meas. natural. Failing to find any reasonable explanation for the incongruity of this case I must look for it in the fact that, dating from Dec. 1920, it is one of my very first tests, performed at antime when my technique was not yet quite established and therefore not certain enough as to exclude the possibility of an erroneaus observation from my side.

No. 158 (mb. meniere); left ear suffering. 20° water $\frac{20 \text{ sec.}}{30 \text{ sec.}}$ rot. $\frac{27 \text{ sec.}}{31 \text{ sec.}}$ temp. meas. $\frac{+ 0°.4 \div 0°.3}{+ 0°.7 \div 0°.3}$. Time of latency here decidedly prolonged, whereas the temp. meas. method shows an extreme limit, although it does not exceed the normal and compared with the right side, the limit is somewhat reduced.

The above comparison between the time of latency measured by »mass flushing«, with water of 20° and the irritability-limit measured by my method, shows that the normal time of latency gives but imperfect information as to the condition of the vestibular apparatus, several cases showing normal time of latency where the vestibular apparatus most probably is affected, and where, at any rate, the temp.-meas. method indicates existing abnormities at the same time that in several of the cases a morbid condition can be ascertained by using other methods. The prolonged time of latency according to my experience most often points to an affection of

the vestibular apparatus, anyhow when it is the case that no factors influencing the temperature-conduction of the middle or outer ear intervene. The shortened time of latency on the contrary is, in the cases I have had opportunity to examine, suggesting that time of latency and irritability of the vestibular apparatus are actually two distinguishable factors, which can be almost done independently of one another. And this is not to be wondered at. The time of latency after flushing with 20° water may very well be abnormally short, in the same time that the irritability is abated; but it only goes to say that the vestibular apparatus is in such a condition that it reacts with promptness to a caloric excitation as powerful as flushing with water of 20° must be said to be, and that this excitation is conducted by the reflex-courses with abnormal rapidity, whether this is due to some inhibitory fibres being placed out of function, or to a sort of hyper-sensibility of the nerve-centres, so that the transmission of the nervous impressions takes place with abnormal speed. At the same time that in these cases the conduction of powerful excitations is getting abnormally shortened, the susceptibility for more delicate excitations is abated. The time of latency has, in my opinion, thus its significance collaterally in the measuring of the irritability-limit by my method as regards to indicate deviations from the normal. Possibly later researches may show the lesion to be differently located according to whether the time of latency or the irritability-limit has been brought to bear.

As previously stated I don't consider the »mass-flushing« method suitable for measuring the time latency, in consideration of the fact that by continuing the flushing until nystagmus sets in, one does not apply the same excitant in all cases. It is possible that this difference in intensity of the excitant does not mean so much regarding the time elapsing before the appearance of nystagmus as it at first seems to do, because most probably the said period is determined by the effect on the labyrinth of the very first cubic centimeters, and it is not likely that the following quantities contribute in making the evoked nystagmus appear earlier, but only in strengthening it somewhat. Theoretically, however, it seems preferable for measuring the time of latency to use a method whereby the vestibular apparatus is exposed to a homogeneous excitement, so powerful that it may be expected to evoke reaction in most cases, and for this purpose the short flushing a. m. Demetriades & Mayer, with 5 ccm. 14° water, is probably having the best effect. I have no opportunity of using this method, but have several times made tests a. m. Kobrak flushing with 5—10 ccm. water at 35°—27°. It is true, that by means of this test we measure the time of latency, but the excitant is not identical in all cases, as flushing with 5 ccm. 35° water is not always sufficient to evoke reaction. In such cases one is obliged to lower the temperature or to augment the quantity of water, i. e., to use a stronger excitant, thereby changing the conditions for testing, and making the comparison of the established times of latency less illustrative.

CALORIC TEST a. m. KOBRAK AS COMPARED WITH THE TEMPERATURE MEAS. TEST.

Besides the normal cases already mentioned above, I have examined 59 cases a. m. Kobrak, and in those where I obtained no reaction by flushing with 5 ccm. 35° water I have increased the excitation at times, augmenting the quantity of water, and then by lowering the temperature, using, howewer, the same amount of water. According to Spira the excitation is more increased by increasing the quantity of water, than by lowering of the temperature some degrees; he having found that 10 ccm. 23° water has a stronger effect than 5 ccm. 14° water. Among the 59 cases, which I have examined a. m. Kobrak, under pathological conditions, there were 6 with otitis media, and they are for the reasons formerly set forth, omitted; 3 had spontaneous nystagmus and were thus, therefore, not very suitable in this comparison; the remainder consisting of 50 cases I shall here refer to briefly.

In individuals with normal vestibular apparatus, examined by me a. m. Kobrak, only 2 out of 28 ears did not react for 5 ccm. water of 35°, and of these 1 reacted for 10 ccm. while the other was not further examined according to this way. In referring to these 100 ears it appears, that among those not reacting for 5 ccm. 35° water, and where a stronger excitation has been required, there are 2 cases (118 and 193), with normal irritability; the rest all show abated irritability by the temp. meas. test. Certainly there are then only 6 where flushed with 10 ccm., and 8 where I have used 30° or 27° water, but these 14 cases, as quoted, also show reduction of irritability by the temp. meas. method. Five ears have when flushing with 5 ccm. 35° water a time of latency of 10 sec. or less, and of these only one (94) had reduced irritability, whilst 4 (87, 117, 144 and 166) show normal irritability with the temp. meas. method. With a time of latency greater than 28 sec. at flushing with 5 ccm. water there are 10 ears, of which 8 show reduced irritability, also by the temp. meas. method, whereas 2 (96 and 102) fell within the normal limit. Meanwhile, within the cases reacting for 5 ccm. 35° water after a time of latency of 11—28 sec. there are no less than 25 ears showing reducted irritability with the temp. meas. method, i. e. in the following numbers: 93,

94, 96, 109, 113, 119, 120, 122, 123, 132, 134, 139, 141, 148, 150, 152, 154, 162, 166, 172, 181, 188.

As compared with other investigators occupying themselves with Kobrak's method for testing the vestibular apparatus, I am reckoning with much more restricted values. Grahe for instance reckons that the normal reaction after flushing with 5 ccm. 27° water sets in within 14—20 sec., and ceases within 100—140 sec., although he proposes to give the physiological limits a wider space, i. e. 10—30 sec. and 60—200 sec. respectively. Demetriades and Mayer find with normal individuals nystagmus of first degree when flushing with 3 ccm. water, within 25—40 sec. and nystagmus of first to second degree within 10—30 sec. when flushing with 5 ccm. 13° water. Spira quotes that when flushing with 5 ccm. water the interval for the appearance of nystagmus reaches from 28° down to 14°.

These differences essentially depend upon,that almost every author has not only his special technique, but also an estimation of his own as regards the reactions evoked by the tests; a circumstance which naturally also involves some difficulty in making a comparative estimation of the different results arrived at.

That I in my opinion am not too particular, or, in other words that my rules as to the time at which nystagmus is reckoned as setting in are not too limited, is, I think, proved sufficiently by the fact that almost all the cases without those limits, which — as a rule — I have placed as my normal individuals, tested a. m. Kobrak, actually proved to be pathological, also when they were tested by using the temperature-measuring method; and moreover, that even among those cases, which still react within the limits, indicated by me (as regards the majority) as being normal, and which are much more restricted, than those established by any other investigator, a great number are shown to have abated irritability when tested by the temp. meas. method.

DOUBLE-FLUSHING (a. m. RUTTIN).

In many of my pathological cases I have performed double-flushing, that is, simultaneously exposed both ears to caloric excitation of even strenght. My technique has not been quite identical with that described by R u t t i n, for I have made use of the same apparatus which served me for my ordinary flushing with 20° water, merely making the water flow to both ears by means of a T inserted on the rubber tube (the technique is described in closer detail by T h o r n v a l: diss. pag. 65—67). To give a general view I shall make a short extract of the journals, which may be of interest in this connection.

No. 89. Syphilis. Never ear disease or dizziness. Tymp. mem. natural. Boneconduction: $\frac{7 \text{ sec.}}{5 \text{ sec.}}$

20° water $\frac{15 \text{ sec.}}{20 \text{ sec.}}$ rot. $\frac{39 \text{ sec.}}{55 \text{ sec.}}$ temp.-meas. $\frac{+1°.3 \div 0°.3}{+0°.5 \div 1°.1}$

D. fl. 20° water $\frac{560 \text{ ccm.}}{720 \text{ ccm.}}$ gives nystagmus to left side.

According to the caloric tests the left ear's irritability to cold excitation is affected. D. fl. with warm water was unfortunately not made.

No. 93. Syphilis. Temp. mem. normal. Hearing natural.

20° water $\frac{17 \text{ sec.}}{17 \text{ sec.}}$ rot. $\frac{35 \text{ sec.}}{35 \text{ sec.}}$ 5 ccm. 35° $\frac{12 \text{ sec.}}{12 \text{ sec.}}$

Temp. meas. $\frac{+0°.3 \div 0°.8}{+0°.3 \div 0°.4}$

D. fl. 20° $\frac{320 \text{ ccm.}}{240 \text{ ccm.}}$ gives dubious nystagmus to right.

Here my method shows a slight reduction of the irritability to cold excitation on right side; the other tests show nothing. D. fl. with cold water shows a slight reduction of irritability in right ear, in spite of its having been flushed with more water than the left ear.

No. 102. Syphilis. No ear disease. Tymp. mem. natural. Hearing normal. Boneconduction $\frac{7 \text{ sec.}}{12 \text{ sec.}}$

20° water $\frac{9 \text{ sec.}}{16 \text{ sec.}}$. rot. $\frac{20 \text{ sec.}}{22 \text{ sec.}}$ 5 ccm. 35° $\frac{29 \text{ sec.}}{\text{none}}$ 10 ccm. 35° $\frac{}{42 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.2 \div 0°.3}{+ 0°.3 \div 1°.5}$

D. fl. 20° $\frac{70 \text{ ccm.}}{85 \text{ ccm.}}$ nystagmus to l. after 40 sec.

D. fl. 20° $\frac{50 \text{ ccm.}}{80 \text{ ccm.}}$ nystagmus to l. after 30 sec.

D. fl. 48° $\frac{420 \text{ ccm.}}{710 \text{ ccm.}}$ no nystagmus (3. min.) $\frac{420 \text{ ccm.}}{520 \text{ ccm.}}$ no nystagmus.

Flushing with water of 20°, and Kobrak's test show a reduction irritability of left ear; my method shows the same for cold excitation only, whereas for warm excitation the irritability is normal ,and essentially equal on both sides. In accordance herewith D. fl. with cold water gives reaction from right ear, whereas D. fl. with warm water does not show reaction.

No. 104. Syphilis. Tymp. mem. and hearing normal.

20° water $\frac{19 \text{ sec.}}{24 \text{ sec.}}$. rot. $\frac{32 \text{ sec.}}{37 \text{ sec.}}$ temp. meas. $\frac{+ 0°.4 \div 0°.6}{+ 0°.2 \div 1°.5}$

D. fl. 20° $\frac{\text{r. } 800 \text{ ccm.}}{\text{l. } 900 \text{ ccm.}}$ nystagmus to left after 3 min.

D. fl. 46° $\frac{\text{r. } 810 \text{ ccm.}}{\text{l. } 900 \text{ ccm.}}$ no sure nystagmus (3 min.).

Here we see the same as above, that the reduction of irritability in left ear found by flushing with 20° water, is, by my method, shown to apply only to cold excitation, while it is normal for warm excitation.

No. 119. Syphilis. No ear disease. Tymp. mem. and hearing normal.

20° water $\frac{11 \text{ sec.}}{13 \text{ sec.}}$. rot. $\frac{41 \text{ sec.}}{47 \text{ sec.}}$ 5 ccm. 35° $\frac{22 \text{ sec.}}{27 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.4 \div 0°.4}{+ 0°.2 \div 1°.0}$

D. fl. 20° $\frac{\text{r. } 140 \text{ ccm.}}{\text{l. } 160 \text{ ccm.}}$ nystagmus to left after 45 sec.

D. fl. 48° $\frac{\text{r. } 150 \text{ ccm.}}{\text{l. } 160 \text{ ccm.}}$ nystagmus to left after 50 sec.

Here left ear reacts somewhat more slowly than the right one when testing with 20° water, as well as a. m. Kobrak, and my

method shows that the reduction applies only to cold excitation, whilst for warm excitation the reaction is rather reduced in the right ear, the difference being so slight though, that as a rule I should not take it into account. It is shown, however, that D. fl. with cold water gives reaction from the right ear, and with warm water from the left.

No. 134. Syphilis. Vertigo five months ago when infection took place. Tymp. mem. and hearing natural.

20° water $\frac{10\text{ sec.}}{14\text{ sec.}}$. rot. $\frac{\text{no nystagmus}}{\text{no nystagmus}}$ 5 ccm. 35° $\frac{15\text{ sec.}}{16\text{ sec.}}$

Temp. meas. $\frac{+1°.2 \div 0°.8}{+0°.4 \div 0°.8}$

D. fl. 20° $\frac{\text{r. 400 ccm.}}{\text{l. 520 ccm.}}$ no nystagmus (3½ min.).

D. fl. 47° $\frac{\text{r. 180 ccm.}}{\text{l. 280 ccm.}}$ nystagmus to left after 75 sec.

Testing by my method shows irritability towards cold excitation reduced, the reduction being equal in both ears, whereas for warm excitation the irritability is reduced in the right ear only. Neither does D. fl. give reaction when testing for cold excitation, whereas by testing for warm excitation there is a reaction from left ear; here it might, however, be objected that by double-flushing with warm water a greater quantity is used in the left ear than in the right.

No. 139. Syphilis. No ear disease. Tymp. mem. and hearing natural. Bone-conduction: $\frac{15\text{ sec.}}{9\text{ sec.}}$

20° water $\frac{9\text{ sec.}}{15\text{ sec.}}$. rot. $\frac{24\text{ sec.}}{31\text{ sec.}}$ 5 ccm. 35° $\frac{25\text{ sec.}}{22\text{ sec.}}$

Temp. meas. $\frac{+0°.6 \div 0°.6}{+0°.4 \div 1°.4}$

D. fl. 20° $\frac{\text{r. 580 ccm.}}{\text{l. 840 ccm.}}$. Nystagmus to left (4 min. 55 sec.).

D. fl. 47° $\frac{\text{r. 650 ccm.}}{\text{l. 700 ccm.}}$. No nystagmus (5 min.).

Here flushing with water of 20°, and with 5 ccm. at 35°, and by my method give equally reduced irritability in left ear; moreover my method indicates that the irritability by warm excitation is essentially normal. In accordance herewith one gets by double-flushing with cold water reaction from right ear, although flushed with less water than the left one, and no reaction for warm water.

No. 148. Mb. meniere. Tymp. mem. natural. Whispering $\frac{9\text{ m.}}{> 13\text{ m.}}$ Bone=conduction $\frac{10\text{ sec.}}{20\text{ sec.}}$

20° water $\frac{24\text{ sec.}}{16\text{ sec.}}$. rot. $\frac{14\text{ sec.}}{18\text{ sec.}}$. 5 ccm. 35° $\frac{14\text{ sec.}}{16\text{ sec.}}$

Temp. meas. $\frac{+1°.1 \div 1°.1}{+0°.3 \div 0°.2}$

D. fl. 20° $\frac{\text{r. } 100\text{ ccm.}}{\text{l. } 70\text{ ccm.}}$. Nystagmus to r (25 sec.).

D. fl. 47° $\frac{\text{r. } 85\text{ ccm.}}{\text{l. } 65\text{ ccm.}}$. Nystagmus to l (20 sec.).

Here according to all tests it is the right ear that is affected. My method shows that the caloric irritability is reduced both as regards cold and warm excitation, and in accordance herewith double=flushing gives reaction from lett ear both to warm and cold excitation.

No. 150. Mb. meniere. Tymp. mem. natural.

Whispering: $\frac{\text{r. } 30\text{ ctm.}}{\text{l.} > 7\text{ m.}}$ Bone=conduction: $\frac{9\text{ sec.}}{9\text{ sec.}}$

20° water: $\frac{13\text{ sec.}}{10\text{ sec.}}$. rot. $\frac{40\text{ sec.}}{45\text{ sec.}}$. 5 ccm. 35° $\frac{20\text{ sec.}}{27\text{ sec.}}$

Temp. meas. $\frac{+1.4 \div 0.4}{+0.3 \div 1.1}$

D. fl. 20°: $\frac{\text{r. } 290\text{ ccm.}}{\text{l. } 430\text{ ccm.}}$. Nystagmus to left.

D. fl. 47°: $\frac{\text{r. } 560\text{ ccm.}}{\text{l. } 350\text{ ccm.}}$. Nystagmus to left.

Acoustically the right ear is affected. By flushing with 20° water irritability of right ear is somewhat more slow than that of the left. Testing a. m. Kobrak shows rather reduced irritability on left ear. By rotation left ear reacts a little more quickly than the right. My method shows on right ear normal irritability towards cold, and reduced irritability towards warm excitation, which is clearly confirmed by the double=flushing, reacting with cold water from right ear, and with warm water from left.

No. 152. Mb. meniere. Tymp. mem. normal.

Whispering $\frac{\text{r.} > 7\text{ m}}{\text{l. } 1\text{ m.}}$ Bone=conduction $\frac{\text{r. } 30\text{ sec.}}{\text{l.} \div}$

20° water $\frac{22\text{ sec.}}{32\text{ sec.}}$. rot. $\frac{20\text{ sec.}}{25\text{ sec.}}$. 5 ccm. 35° $\frac{25\text{ sec.}}{28\text{ sec.}}$

Temp. meas. $\frac{+0°.8 \div 0°.3}{+3°.0 \div 1°.2}$

D. fl. 20° water $\frac{\text{r. 115 ccm.}}{\text{l. 75 ccm.}}$. Nystagmus to left (25 sec.).

D. fl. 47° water $\frac{\text{r. 115 ccm.}}{\text{l. 115 ccm.}}$. Nystagmus to right (40 sec.).

Left ear is affected, and the irritability is reduced both towards cold and warm excitation, conforms well with D. fl.

No. 153. Mb. meniere. Tymp. mem. normal.

Whispering $\frac{> 8 \text{ m.}}{20 \text{ ctm.}}$ Bone-conduction $\frac{\text{r. 11 sec.}}{\text{l. } \div}$

20° water $\frac{16 \text{ sec.}}{16 \text{ sec.}}$. rot. $\frac{37 \text{ sec.}}{35 \text{ sec.}}$ temp. meas. $\frac{+ 0°.3 \div 0°.7}{+ 0°.3 \div 0°.6}$

Double flushing with 20° water gives after 1 min. vertical nystagmus upwards; agrees in all tests, as there is no difference in irritability on the two sides.

No. 154. Mb. meniere.

Whispering $\frac{8 \text{ m.}}{> 13 \text{ m.}}$. Bone-conduction: $\frac{6 \text{ sec.}}{11 \text{ sec.}}$

20° water $\frac{16 \text{ sec.}}{10 \text{ sec.}}$ 5 ccm. 35° $\frac{17 \text{ sec.}}{12 \text{ sec.}}$ temp. meas. $\frac{+ 1°.1 \div 1°.1}{+ 0°.3 \div 0°.4}$

D. fl. 20° water $\frac{320 \text{ ccm.}}{400 \text{ ccm.}}$ Nystagmus to right (2 min. 20 sec.).

D. fl. agrees very well with the other tests, although left ear has had some more water than the right one.

No. 157. Mb. meniere.

Whispering $\frac{3 \text{ m.}}{> 8 \text{ m.}}$. Bone-conduction $\frac{\div}{12 \text{ sec.}}$

20° water $\frac{12 \text{ sec.}}{14 \text{ sec.}}$. rot. $\frac{35 \text{ sec.}}{23 \text{ sec.}}$ 5 ccm. 35° $\frac{\text{no nyst.}}{19 \text{ sec.}}$ 10 ccm. 35° $\frac{35 \text{ sec.}}{\quad}$

Temp. meas. $\frac{+ 0°.5 \div 1°.0}{+ 0°.3 \div 0°.3}$

D. fl. 20° water $\frac{\text{r. 105 ccm.}}{\text{l. 72 ccm.}}$ Nystagmus to right side.

The acoustic test, Kobrak's, and my test show the right ear affected, whilst the test with 20° water shows nothing.

D. fl. indicates less irritability on right ear.

No. 159. Mb. meniere. Tymp mem. calcium-infiltrated.

Whispering $\frac{\text{r.} > 8 \text{ m.}}{\text{l. 1 m.}}$ Bone-conduction: $\frac{\text{r. 21 sec.}}{\text{l. 12 sec.}}$

20° water $\frac{12 \text{ sec.}}{22 \text{ sec.}}$. rot. $\frac{26 \text{ sec.}}{22 \text{ sec.}}$ temp. meas. $\frac{+ 0°.5 \div 0°.2}{+ 1°.2 \div 0°.7}$

D. fl. 20° water $\frac{\text{r. 70 ccm.}}{\text{l. 65 ccm.}}$. Nystagmus to left (25 sec.).

D. fl. 48° water $\frac{\text{r. 100 ccm.}}{\text{l. 105 ccm.}}$. Nystagmus to right (32 sec.).

The function of left ear is reduced. The temp. method shows that the caloric irritability is reduced towards both warm and cold excitation, which is verified by the double-flushing.

No. 164. Neuritis acustica.

Whispering $\frac{\text{ad concham}}{\text{ad concham}}$. Bone-conduction $\frac{0}{7 \text{ sec.}}$

20° water $\frac{14 \text{ sec.}}{14 \text{ sec.}}$ 5 ccm. 35° $\frac{20 \text{ sec.}}{22 \text{ sec.}}$ temp. meas. $\frac{+ 0°.7 \div 0°.3}{+ 0°.2 \div 0°.3}$

D. fl. 20° $\frac{\text{r. 400 ccm.}}{\text{l. 400 ccm.}}$. No nystagmus (3 min.).

D. fl. 48° $\frac{\text{r. 120 ccm.}}{\text{l. 140 ccm.}}$. Nystagmus to left (35 sec.).

Flushing with 20° water, and a. m. Kobrak do not show any difference on the two sides; my method indicates that the irritability is reduced as regards warm excitation on right ear, and also after testing the bone-conduction one should expect the right ear to be the more affected. Double-flushing with cold water does not give any reaction, whereas with warm water one gets reaction from left ear — in good accordance with the test by my method.

No. 166. Neuritis acustica. Tymp. mem. normal.

Whispering $\frac{1 \text{ m.}}{30 \text{ ctm.}}$ Bone-conduction $\frac{10 \text{ sec.}}{6 \text{ sec.}}$

20° water $\frac{6 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{35 \text{ sec.}}{32 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.8 \div 0°.2}{+ 0°.6 \div 0°.6}$ 5 ccm. 35° $\frac{5 \text{ sec.}}{16 \text{ sec.}}$

D. fl. 20° $\frac{\text{r. 60 ccm.}}{\text{l. 60 ccm.}}$. Nystagmus to left (15 sec.).

D. fl. 48° $\frac{\text{r. 260 ccm.}}{\text{l. 240 ccm.}}$. No nystagmus (90 sec.).

Right ear is more easily affected by cold excitation, which agrees with D. fl. with cold water. Towards warm excitation the irritability is about equal; D. fl. does not give any reaction for warm water either. (The test had to be discontinued, the patient refusing further flushing).

No. 187. Seq. labyrinthitidis. Tymp. mem. calcium infiltrated.

Whispering $\frac{0}{> 8 \text{ m.}}$ Shouting $\frac{0}{\quad}$. Bone-conduction $\frac{0}{8 \text{ sec.}}$

20° water $\frac{23 \text{ sec.}}{22 \text{ sec.}}$. rot. $\frac{17 \text{ sec.}}{21 \text{ sec.}}$ temp. meas. $\frac{+ 2°.0 \div 1°.6}{+ 0°.6 \div 0°.8}$

D. fl. 20° $\frac{\text{r. } 145 \text{ ccm.}}{\text{l. } 125 \text{ ccm.}}$. Nystagmus to right (40 sec.).

D. fl. 47° $\frac{\text{r. } 210 \text{ ccm.}}{\text{l. } 205 \text{ ccm.}}$. Nystagmus to left (54 sec.).

Here irritability reduced in both ears, mostly in the right, for both warm and cold excitation. D. fl. gives same result.

All examinations hitherto mentioned shew the d. fl. agrees well with the other methods for testing the caloric irritability, in any case with my method, by which in some cases the agreement is even so conspicuous, that it might be said to afford an argument speaking in favour of my method for determining the caloric irritability (e. g. see cases nos. 102, 104, 119, 134, 150, 164). There are, however, among my material also some cases where double-flushing do not agree with the other tests, and in that respect my method is no exception; and moreover there are instances showing my method alone as disagreeing with the D. fl., whilst the others are in accordance therewith.

No. 100. Syphilis. Vertigo during menstruation, otherwise nil. Tymp. mem. natural. Hearing normal.

20° water $\frac{10 \text{ sec.}}{15 \text{ sec.}}$. rot. $\frac{48 \text{ sec.}}{39 \text{ sec.}}$ 5 ccm. 35° $\frac{14 \text{ sec.}}{22 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.3 \div 0°.2}{+ 0°.2 \div 0°.8}$

D. fl. 20° after 3 min. no nystagmus.

According to all tests there nystagmus ought to appear on left, this, however, does not occur. It must, however, be noted that I have forgotten to check the amount of water used in D. fl., which possibly may account for an error.

No. 113. Syphilis. No ear disease or vertigo. Drum membranes slightly reddish. Hearing normal.

Bone-conduction $\frac{\text{r. } 17 \text{ sec.}}{\text{l. } 17 \text{ sec.}}$

20° water $\frac{12 \text{ sec.}}{16 \text{ sec.}}$ rot. $\frac{26 \text{ sec.}}{35 \text{ sec.}}$

5 ccm. 35° $\frac{12 \text{ sec. } 1 \text{ stroke}}{10 \text{ sec. } 1 \text{ stroke}}$, 1 min. later: $\frac{13 \text{ sec.}}{11 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.8 \div 1°.4}{+ 1°.0 \div 0°.7}$

D. fl. 20° $\frac{\text{r. } 660 \text{ ccm.}}{\text{l. } 690 \text{ ccm.}}$ no nystagmus ($4^1/_2$ min.).

Testing with 20° water shows the left ear reacts more slowly, testing a. m. Kobrak the right one reacts slightly more slowly. Rot. gives less reaction from right than left side. My method shows reduction towards cold excitation, greater in right ear. D. fl. does not give any reaction whatever.

No. 130. Syphilis. Tymp. mem. normal.

Whispering $\frac{> 8\text{ m.}}{0}$ Shouting $\frac{\quad}{0}$

20° water $\frac{12\text{ sec.}}{15\text{ sec.}}$ rot. $\frac{23\text{ sec.}}{32\text{ sec.}}$ 5 ccm. 35° $\frac{17\text{ sec.}}{0}$

5 ccm. 27° $\frac{\quad}{16\text{ sec.}}$ temp. meas. $\frac{+\,0°.3 \div 0°.2}{+\,1°.2 \div 2°.4}$

D. fl. $\frac{\text{r. } 590\text{ ccm.}}{\text{l. } 580\text{ ccm.}}$ after 4 min. no nystagmus.

In this case after the accoustic test a reduction of the vestibular irritability of left ear might be expected; this is also found by a test according to my method and to a lesser degree on testing with water 20° and by Kobraks method; at any rate by double flushing no reaction is noted from either side. The variation in irritability as regards cold between right and left ears is not less than 2°.2, and such a variation calls for a result on double flushing.

No. 132. Syphilis cong. Tymp. mem. normal. Hearing normal.

20° water $\frac{22\text{ sec.}}{35\text{ sec.}}$. rot. $\frac{34\text{ sec.}}{35\text{ sec.}}$ 5 ccm. 35° $\frac{20\text{ sec.}}{\div}$

10 ccm. 35° $\frac{\quad}{25\text{ sec.}}$ temp. meas. $\frac{+\,0°.7 \div 1°.3}{+\,1°.1 \div 2°.5}$

D. fl. $\frac{300\text{ ccm.}}{360\text{ ccm.}}$ after 3 min. no nystagmus.

As in the previous case there is here a considerable difference in irritability as regards cold in both ears, the left ear reacting at a temperature 1°.2 lover than the right, and the other caloric tests prove a weaker reaction in the right than in the left (on flushing the left ear with 20° water a decidedly pathological time of latency is obtained); double flushing gives no reaction.

No. 163. Neurit. acust. Hyperæstesia nerv. vestibular. Tymp. mem. normal. Hearing nat. except bone-conduction shortened.

20° water $\frac{3\text{ sec.}}{10\text{ sec.}}$. rot. $\frac{22\text{ sec.}}{25\text{ sec.}}$ temp. meas. $\frac{+\,0°.2 \div 1°.8}{+\,0 \quad \div 1°.8.}$

. D. fl. $\frac{\text{r. } 260\text{ ccm.}}{\text{l. } 240\text{ ccm.}}$ Nyst. to r. (90 sec.). D. fl. 47° nyst. to l. (64).

Double flushing gives reaction from left ear in spite of the fact that my test proves an equal reduction of irritability on both sides, and the water test at 20° shews a considerable increase of irritability on right.

No. 168. Neurit. acust. Tymp. mem. normal. Hearing normal. Bone=conduction $\frac{\text{r. 8 sec.}}{\text{l. 10 sec.}}$ Weber ↓.

20° water $\frac{\text{14 sec.}}{\text{12 sec.}}$ 5 ccm. 35° $\frac{\text{17 sec.}}{\text{17 sec.}}$ temp. meas. $\frac{+ 2°.4 \div 0°.2}{+ 0°.2 \div 1°.0}$

D. fl. 20° $\frac{\text{r. 100 ccm.}}{\text{l. 100 ccm.}}$ nyst. to r. after 37 sec.

D. fl. 48° $\frac{\text{r. 100 ccm.}}{\text{l. 100 ccm.}}$ nyst. to left after 32 sec

According to the acoustic test the right ear is affected. D. fl. shows reduced irritability on right ear, both to cold and warm excitation. Flushing with 20° water and testing a. m. Kobrak de=monstrate no abnormity whatever. Testing by my method shows reduced reaction in right ear for warm, and in left towards cold excitation. The cold D. fl. thus agrees well with all other tests, whereas the warm D. fl. gives a result contrary to mine.

No. 176. Neurit. acust. Tymp. mem. normal.

Whispering $\frac{\text{10 m.}}{> \text{11 m.}}$ Bone=conduction $\frac{\text{r. 8 sec.}}{\text{l. 8 sec.}}$

Never ear disease or dizziness.

20° water $\frac{\text{19 sec.}}{\text{8 sec.}}$ rot. $\frac{\text{17 sec.}}{\text{17 sec.}}$ 5 ccm. 35° $\frac{0}{\text{17 sec.}}$

10 ccm. 35° $\frac{\text{19 sec.}}{}$ temp. meas. $\frac{+ 1°.5 \div 0°.5}{+ 0°.3 \div 0°.5}$

D. fl. 20° $\frac{\text{r. 460 ccm.}}{\text{l. 510 ccm.}}$. Nystagmus to left (2 min.).

D. fl. 47° $\frac{\text{r. 205 ccm.}}{\text{l. 350 ccm.}}$. Nystagmus to r. (ca. 1 min.).

3 months later: D. fl. 20° $\frac{\text{r. 480 ccm.}}{\text{l. 650 ccm.}}$. Nystagmus to l. (3 min.).

D. fl. 47° $\frac{\text{r. 400 ccm.}}{\text{l. 520 ccm.}}$. Nystagmus to r. ($2^1/_2$ min.).

On right ear hearing is slightly impared. Testing with 20° water and by Kobrak's method also show reduction in the irrita=bility of right ear. By my test the irritability in right ear is found reduced although only for warm excitation. Nevertheless D. fl. both with cold and warm water gives a decided reaction from right ear contrary to all the other tests.

No. 181. Vertigo. Psychastenia. Drum membranes dim. Hearing normal.

20° water $\frac{\text{25 sec.}}{\text{20 sec.}}$ rot. $\frac{\text{32 sec.}}{\text{35 sec.}}$ temp. meas. $\frac{+ 2°.6 \div 0°.4}{+ 0°.2 \div 2°.5}$

D. fl. 20° $\frac{\text{r. 610 ccm.}}{\text{l. 725 ccm.}}$ no nystagmus (4 min.).

D. fl. 48° $\frac{\text{r. 1040 ccm}}{\text{l. 1080 ccm}}$ no nystagmus (4 min.).

The tests with 20° water and by my method disagree. Both of them certainly show greatest reduction in the irritability of right ear, but the temp.-meas. method indicates the reduction to be confined to the irritability for warm excitation, only, whereas reduction for cold excitation is found in left ear. The lack af reaction by both the double-flushings is incomprehensible, viewed in connection with the other caloric tests, and especially when considering the result of the temp-meas. test.

The rest of the incongruous results of the double-flushing can for the most part be explained by various deficiencies in the technique, e. g. by having flushed with unequal quantities of water, which may have had the effect either that the reaction did not take place at all, or has been brought about from the more affected ear, because this has been subjected to flushing with greater quantities of water than the one less affected.

On the other hand, as seen by the preceding, D. fl. in many cases shows an exceedingly accurate agreement with the other caloric tests. In many instances the conformity with the temp.-meas method., when this shows the irritability having altered in reference to the one caloric quality and not the other, is so striking, that it almost proves the superiority of the temp.-meas. method; and, when I nevertheless, have found relatively so many cases that do not indicate agreement between the D. fl. and the other caloric methods, the temperature-measuring included, one might expect to find this explained in some way or other.

Ruttin has already in his original work on double-flushing stated, that he sometimes gets a result contrary to what he had expected, and in such cases he assumes that it is a question of inhibitory fibres being destroyed, which might account for the contrary reaction. But in cases where the double-flushing gives no reaction, although it should have been expected according to the other tests, (Nos. 100, 113, 130, 132, 181), this explanation is not satisfactory, as by it one would presume, that in these cases the inhibitory fibres were affected just to a degree corresponding to the actual reduction of the labyrinthine irritability so as to cause the two factors to neutralize one another. This apparent equilibrium which might be presumed analogous with that compensation so often occurring during the rotatory test, should then make its appearance only when both vestibular apparatus were affected simultaneously, whereas it should fail immediately each side was tested separately. When, as a matter of fact, each side is examined separately, no values are found pointing towards a compensation.

I cannot give any satisfactory explanation of the fact that the double-flushing in several cases fails to give any information about the existence of one-sided vestibular changes, or about evident differences in irritability of the two sides, but can only point to the fact, and state that it must be reckoned with. One must likewise be prepared to expect to get deceptive reactions by double-flushing, when endeavouring to ascertain which of the two sides is affected, as sometimes the double-flushing gives reactions, which may induce erroneous conclusions as to the side where the disease is located.

SPONTANEOUS NYSTAGMUS.

When I began my researches concerning nystagmus evoked by caloric excitation I set aside all cases which proved to have spontaneous nystagmus, thinking that in these patients my researches would be fruitless. However later on the idea struck me, that perhaps it might be possible by means of the temp.-measuring method of investigation to obtain a measure of the force of the spontaneous nystagmus, and thereby also arrive at an estimation of the force of the lesion causing it. With a view to this I examined some individuals with spontaneous nystagmus, but on account of the reserve which I felt towards cases of that kind, most of the time I was occupied with the researches, my material referring to spontaneous nystagmus is relatively small, comprising only 14 cases. In cases of spontaneous nystagmus it is not the irritability-limit, when reaction sets in, that is determined by the temp.-meas. method, but the point where the spontaneous nystagmus ceases — that is, is counter-balanced by the adverse effect due to the caloric excitation — and that point where the excitation becomes so strong as to produce nystagmus of a contrary type. These two points are found on the same side of the body temperature. If, for instance, a lesion exists on the right labyrinth, reducing, but not suppressing, the irritability on the right side, and giving spontaneous nystagmus to left, this spont. nystagmus may possibly be neutralized by the excitant $\div$ 1° on right ear while the excitant + 2° gives nystagmus to right. By this, however, no information is given as to whether an excitation by water below body-temperature is capable of evoking reaction from right labyrinth, neither is it possible to indicate how strong such an excitant must be in order to produce reaction: One gets kind of a measure of the force of nystagmus and — assuming its being proportional with the degree of the lesion — also an estimation of the latter. Now it is often case that the force of the excitant required to counterbalance the spontaneous nystagmus is not the same on both sides, and the question arises then which of them one must reckon with. It seems likely that the most reliable expression for the force of nystagmus might be obtained by counting with the degrees required for neutralizing the spontaneous nystagmus

by flushing the sound ear, where the labyrinth must be supposed to react normally, and to give a figure suitable for comparison, whereas the figure resulting from flushing sick side, probably is influenced by the reduced reaction from this labyrinth, and thus is likely to be too high. It is often very difficult to find ones way in these cases of spontaneous nystagmus, primarily because it is not always an easy matter to ascertain which side is affected, secondly because one must take into account that often the spont. nystagmus does not originate from the vestibular apparatus. In these so-called intra-cranially originated cases of spont. nystagmus it, however, may be possible to gain some information by examining the patient with the temp-meas. method, as it may be expected that the excitant, required for neutralizing the spont. nystagmus is equal in strength on both sides, only being of unlike quality. However my material being so very limited, it is not suitable for the solution of such problems. Nevertheless I shall briefly render an account of my cases with spont. nystagmus and quote what I am of the opinion can be inferred therefrom.

No. 57. Radically operated on both ears for otitis media. chr. dupl. Previous to operation no nystagmus, only once falling tendency to right with vertigo. Presently spont. nystagmus to left, not constant before, but during flushing, even when flushing with water of temperatures, which counteract nystagmus.

5 ccm. 35° water $\frac{\text{14 sec. augmented nyst.}}{\text{no nyst.}}$. 10 ccm. 35° water $\frac{\text{——}}{\text{22 sec.}}$

Rot. $\frac{\text{33 sec.}}{\text{28 sec.}}$ temp. meas. $\frac{+ 1° \text{ still nyst. to left} \quad + 2°.2 \text{ nyst to right}}{\div 0°.6 \text{ still nyst. to left} \quad \div 1°.2 \text{ nyst. to right}}$

Difference $\frac{1°.2}{0°.6}$

On right ear reduced caloric irritability corresponding to the spont. nystagmus and the falling tendency to right. To arrest the nystagmus one must also withdraw more from the body temperature on right ear (+ 1°) than on left (+ 0°.6). The flushing with 5 ccm. 35° water is not in contradiction hereto, as it is likely that a stronger excitant is required to turn the nystagmus than to augment one already existing. The force of the spontaneous nystagmus (degree of the lesion?) is between 0°.6 and 1°.2.

No. 73. Radically operated 9 months previous to examination, later dizzy during flushing. About 4 months ago had some granulations removed in the cavity from then mire dizziness. Suffering a deal from head-ache. Right ear normal.

20° water $\frac{\text{14 sec. duration}}{\text{5 sec. duration}} \frac{\text{135 sec.}}{\text{95 sec.}}$ rot. $\frac{\text{30 sec.}}{\text{47 sec.}}$

Temp. meas. $\frac{+ 0°.6 \text{ still nyst. to l.} \quad + 1°.1 \text{ nyst. to r.}}{\div 0°.6 \text{ still nyst. to l.} \quad \div 0°.8 \text{ nyst. to r.}}$. Difference $\frac{0°.5}{0°.2}$

Right side normal; spont. nystagmus explained naturally as an irritation efficient of left ear (cf. time of latency 5 sec., by temp. method. difference 0°.2). Force of nystagmus is between 0°.6 and 1°.1.

No. 98. Old syphilis. Totally deaf on right ear; faint hearing on left ear. Spont. nystagmus to left.

20° water $\frac{\div}{19 \text{ sec. dur. } 91 \text{ sec.}}$ rot. $\frac{17 \text{ sec.}}{17 \text{ sec.}}$ 5 ccm. 35° water $\frac{\quad}{\div}$

5 ccm. 27° $\frac{\quad}{30 \text{ sec.}}$

Temp. meas. $\frac{+ 10° \text{ before nyst. stopping}}{\div 2° \text{ still nyst to left.} \div 2°.4 \text{ nyst. to right.}}$

Difference $\frac{?}{0°.4}$

Spont. nystagmus consequent on reduction of irritability on right ear. Vestibular apparatus on left side essentially normal. Force of nystagmus between 2° and 2°.4.

No. 99. Syphilis; given birth to a macerated child. Hearing normal. Bone-conduction slightly shortened. Has strab. div. con-com. sin. with squintangle 20°. Cerebro-spinal fluid natural. Spont. nystagmus to right. No spont. falling tendency; light spont. outward past-pointing in both shoulders.

20° water $\frac{110 \text{ sec. before nyst. turning. duration } 89 \text{ sec.}}{\quad}$. Rot. $\frac{30 \text{ sec.}}{30 \text{ sec.}}$

Temp. method. $\frac{\div 0°.5 \text{ still nyst. to r.} \div 1°.3 \text{ nyst. to l.}}{+ 6°.7 \text{ still nyst. to r.} + 7°.5 \text{ nyst. to l.}}$. Diff. $\frac{0°.8}{0°.8}$

Nystagmus possibly due to strabismus; in such cases nystagmus is often seen by lacking fixation, such as here when Bartels glasses are being used. That the difference is the same on both sides seems to indicate that it is a matter of a mere optic nature.

No. 109. Syphilis cong. Hearing normal; left tymp. mem. cicatrial; spont., nearly exclusively rotatory nystagmus most often to left. The difference between slow and fast phase not always distinct, however. By side glance powerful horiz.-rotatory nystagmus is produced to the same sides. No falling tendency or past-pointing; (stands steadly on one foot). Cerebro-spinal fluid: 7 cells.

20° water $\frac{8 \text{ sec. dur. } 115 \text{ sec.}}{13 \text{ sec. dur. } 105 \text{ sec.}}$ rot. $\frac{29 \text{ sec.}}{50 \text{ sec.}}$

5 ccm. 35° water $\frac{15 \text{ sec. (series of jerks to l.)}}{18 \text{ sec. (series of jerks to r.)}}$

Temp. meas. $\frac{+ 1.5 \div 0.3}{+ 0.7 \div 0.5}$. Difference $\frac{1°.8}{1°.2}$

The observation in this case encounters much difficulty because a series of small nystagmatic jerks without certain direction are continually appearing, so that the question whether reaction has taken place or not, must be decided by observing whether past-pointing occurs while the vestibular apparatus is being affected by the different temperatures. As I have not used this criterion in the remaining of my investigations, the result cannot be juxtaposited to those of the others. There is in this case most probably an intra-cranial disease, causing, the atypic nystagmus, and very likely a slight affection of the right vestibular apparatus (Rot. and temp. meas. tests.). The force of nystagmus is 0°.5—0°.7.

No. 112. Syphilis. Hearing natural. Spont. nystagmus to left. Cerebro-spinal fluid normal.

20° water $\frac{\text{12 sec. dur. 136 sec.}}{\text{21 sec. dur. 93 sec.}}$ Rot. $\frac{\text{20 sec.}}{\text{35 sec.}}$

Temp. meas. $\frac{+\ 0°.3 \text{ still nyst. to } +\ 1°.3 \text{ nyst. to r.}}{\div\ 0°.6 \text{ still nyst. to } \div\ 1°.4 \text{ nyst. to r.}}$ Diff. $\frac{1°.0}{0°.8}$

Possibly the irritability of right vestibular apparatus slightly reduced; nystagmus turns here to the side where very likely the lesion is located, at a temperature nearer to the body-temp. than on the other side, which makes it difficult to pronounce judgment. That the difference on right and left side is not the same, although very nearly so (1° and 0°.8), is due to the margin inevitable as it is, when one cannot examine nystagmus by differences in temperature smaller than ca. 0°.2. It is possible then that the difference is really equal on the two sides, and in that case nystagmus is most probably of intra-cranial origin.

No. 114. Syphilis. Tymp. mem. retracted. Whispering $\frac{0.40}{0.20.}$

Bone-conduction slightly shortened on left side; upper tone-limit natural; lower tone-limit a little raised on left side. Spont. nystagmus to left. Cerebro-spinal lymph: ÷ Wass. Cells 83. Glob. 4, Albumin 40. It appears that by the temp.-meas. method the testing-apparatus being applied to left ear nystagmus very seldom occurs, and has practically disappeared, whereas it persists when the apparatus is applied to right ear.

20° water $\frac{\text{14 sec. dur. 136 sec.}}{\text{18 sec. dur. 115 sec.}}$ Rot. $\frac{\text{20 sec.}}{\text{40 sec.}}$

Temp. meas. $\frac{+\ 1°.1 \text{ const. nyst. to left } +\ 3°.1 \text{ nyst. to right}}{\div\ 0°.7 \text{ const. nyst. to left } +\ 0°.5 \text{ nyst. to right}}$ Diff. $\frac{2°.0}{1°.2}$

On later examination (ca. 1 month later) when he has received some treatment, and the cerebr. spin. lymph. shows: ÷ Wass, Cells. 19, Glob. 2, Alb. 20, the spont. nystagmus proves uneffected whether the apparatus is applied to the left ear or not, and the test gives: Whispering: $\frac{5\text{ m.}}{5\text{ m.}}$

20° water $\frac{13 \text{ sec. dur. } 103 \text{ sec.}}{19 \text{ sec. dur. } 122 \text{ sec.}}$ 5 ccm. 35° $\frac{\div}{\div}$ 5 ccm. 27° $\frac{17 \text{ sec.}}{17 \text{ sec.}}$

Temp. meas. $\frac{+ 0^{\circ}.6 \text{ still nyst. to l.} + 2^{\circ}.2 \text{ nyst. to r}}{\div 0^{\circ}.4 \text{ still nyst. to l.} \div 1^{\circ}.4 \text{ nyst. to r}}$ Diff. $\frac{1^{\circ}.6}{1^{\circ}.0}$

The impairment of hearing is most probably to a great extent due to an affection in the throat, which at the beginning of his sickness caused some swallowing difficulties, and only slightly to a direct ear disease. The hearing test therefore does not afford any indication as to which ear is the more affected. The fact that nystagmus is influenced by the apparatus being applied to the left ear is probably due to circumstances, similar to those which prevail in the so-called reflective nystagmus, only, that here, it is an existing nystagmus which is suppressed in this way; but it must surely be understood as indicating that something is wrong with the left vestibular apparatus. The rotatory test and the temp. meas. test both point to the disease being most pronounced on right side, which is in accordance with the nystagmus being directed to the left side. The suppression of the reflective nystagmus has vanished at the second examination a month later, and at the same time the irritability limit on left ear is reduced from $1^{\circ}.2$ to 1°. On right ear a rather considerable reduction of the irritability persists, and thus it is probably the greater affection of this ear that gives rise to the spontaneous nystagmus. The force of nystagmus is $0^{\circ}.4$—$1^{\circ}.4$.

No. 125. Syphilis. Total deafness on both ears. Spont. nystagmus to left. No spont. past-pointing or falling tendency; still he totters somewhat during the test. Cerebr.-spin. lymph.: + Wass., Cells 49, Glob. 4, Alb. 40.

20° w. $\frac{\text{after 3 min. sp. nyst. unchanged} — \text{no fall. tend. or past. pointing}}{40 \text{ sec. before nyst. turns, dur. } 100 \text{ sec.}}$

Rot. $\frac{5 \text{ sec. (2 strokes)}}{5 \text{ sec. (2 strokes)}}$ temp. meas. $\frac{+ 7^{\circ}.3 \text{ nyst. unchanged to l.}}{+ 5^{\circ}.7 \text{ still nyst. to l.} \div 6^{\circ}.7 \text{ ny. to r}}$

Diff. $\frac{?}{1^{\circ}.0}$

Probably total suppression of vestibular function on right side, and only slight lesion on the left.

Force of nystagmus: $5^{\circ}.7$—$6^{\circ}.7$.

No. 140. Syphilis. Hearing normal. Spont. nystagmus to left (nystagmus is weak and occuring only in optimum position). Cerebr. spinal lymph. essentially natural.

20° water $\frac{20 \text{ sec. dur. } 100 \text{ sec.}}{20 \text{ sec. dur. } 90 \text{ sec.}}$. rot. $\frac{25 \text{ sec.}}{30 \text{ sec.}}$

Temp. meas. $\frac{0^{\circ}. \text{ ny. to l.} + 2^{\circ}.1 \text{ ny. to r}}{\div 0^{\circ}.3 \text{ still. ny. to l.} \div 1^{\circ}.3 \text{ ny. to r}}$ Diff. $\frac{2^{\circ}.1}{1^{\circ}.0}$

D. fl. 20° nystagmus unchanged to left.

Probably a lesion of right ear. That D. fl. does not give any augmented nystagmus to left may be ascribed to the irritability when flushing with water of 20° being equal on both sides. Force of nystagmus: 0°.3—1°.3.

No. 144. Syphilis (congenita?). Hearing normal. Spont. nystagmus to left, only in optimum position though. Cerebr.-spin. fluid: + Was., Cells 70, Glob. 3.5, Alb. 10.

20° water $\frac{\text{11 sec. dur. 115 sec.}}{\text{11 sec. dur. 140 sec.}}$

5 ccm. 35° $\frac{\div}{\text{9 sec.}}$ 5 ccm. 40° $\frac{\div}{}$ rot. $\frac{\text{31 sec.}}{\text{50 sec.}}$

Temp. meas. $\frac{+\,0°.2 \text{ still nyst. to l., } +\,0°.8 \text{ nyst. to r.}}{0° \text{ nyst. to l.} \qquad \div\,0°.4 \text{ nyst. to r.}}$ Diff. $\frac{0°.6}{0°.4}$

Nystagmus may probably be explained from a slight lesion on right ear. Force of nystagmus 0°—0°.4

No. 156. Mb. meniere. Whispering $\frac{\text{0.25 m.}}{> \text{14 m.}}$. Spont. nystagmus to left. Nystagmus is weak, and occurs only in periods.

20° water $\frac{\text{20 sec.}}{\text{15 sec.}}$. rot. $\frac{\text{25 sec.}}{\text{35 sec.}}$

Temp. meas. $\frac{+\,0°.1 \text{ still ny. to l. } +\,0°.8 \text{ ny. to r}}{\div\,0°.3 \text{ still ny. to l. } \div\,0°.9 \text{ ny. to r}}$

Diff. $\frac{0°.7}{0°.6}$ In this case there is on right side the peculiarity that the nystagmus became augmented even when flushing is made with water of more than body-temp. viz. at + 0°.1; at + 0°.4 nystagmus is suppressed. Here, however, a similar condition exists as in No. 112, namely that nystagmus turns for a weaker excitant on the side where the lesion is likely to be located, than on the sound side. Likewise the difference on the two sides is so slight, that the case may be submitted to the same views as No. 112.

No. 161. Mb. meniere. Whispering $\frac{\text{0.05 m.}}{> \text{13 m.}}$. Spont. nystagmus to right weak, and only in optimum position.

20° water $\frac{\text{12 sec. dur. 130 sec.}}{\text{12 sec. dur. 160 sec.}}$

Temp. meas. $\frac{\div\,0°.2 \text{ still nyst. to r. } \div\,0°.9 \text{ nyst. to l.}}{+\,0°.1 \text{ still nyst. to r. } +\,0°.6 \text{ nyst. to. l.}}$. Diff. $\frac{0°.7}{0°.5}$

Right ear is the one affected, and by the temp. meas. method it also shows a somewhat slower reaction than the left. However, the limit lies within the normal, and the difference between the two sides is very slight, so that it might, on the whole, not be taken into account. If, therefore, there is a lesion at all on the

right vestibular apparatus, it can merely be very slight. Perhaps it might be called an irritative lesion of the right ear, causing it to react more slowly than the left one.

Force of nystagmus 0°.1—0°.6.

No. 169. Neuritis acustica? Hearing normal. Bone-conduction shortened. Weak spont. nystagmus to right.

20° water $\frac{\text{20 sec. dur. 175 sec.}}{\text{15 sec. dur. 195 sec.}}$

Temp. meas. $\frac{\div 0°.6 \text{ still ny. to r.}}{\div 0°.4 \text{ ny. to r.}} \quad \frac{\div 1°.6 \text{ ny. to l.}}{0°. \text{ ny. to l.}}$. Diff. $\frac{1°.0}{0°.4}$

Here the spont. nystagmus is suppressed when the apparatus is applied to the left ear, and it is necessary to come down to an excitation of ÷ 0°.4 again to bring about nystagmus to right (cf. conditions in No. 114). On account of this suppression of reflective nystagmus it is difficult to pronounce a judgment of the case.

THE LATENT NON-EQUILIBRIUM.

The use of the temperature measuring method has in several cases made me aware of an occurrence which I shall term a latent lack of equilibrium of the vestibular apparatus. The phenomenon is characterized thereby that on one side a normal value may be found for instance of the cold-irritability, whilst the warm-irritability is reduced, and on the other that the latter is normal whereas there is an abatement, of cold-irritability. The temp. meas. test gives for instance the following result: $\frac{+1°.5 \div 0°.3}{+0°.1 \div 2°.0}$ there is no spontaneous nystagmus, but the irritability of the vestibular apparatus seems displaced on one side in comparison to the other, in such a way that a small additional displacement might be expected to evoke a spontaneous nystagmus. Ophthalmologists use the denomination »latent nystagmus« for at special form of nystagmus. Kobrak uses the expression, »nyst.-readiness« for a distinct condition of the vestibular apparatus. Bories speaks of an »occult nystagmus« in cases where no spont. nystagmus is present, but where nystagmus can be evoked by motions or special positions of the head. Whether the cases referred to, belong to this category or not I cannot decide, as I have not made the tests with this in view, but I shall draw attention to the fact, that by the temp. meas. method such a latent lack of equilibrium of the vestibular apparatus can be observed in many cases, where the other tests give no information of the existence of anything pathological. Maybe later investigations will show the feasibility of evoking nystagmus in similar cases by means of special methods, eventually proving this occurrence to be identical with one of those formerly described. In the only one, where an evocable nystagmus is found (168), showing that it appears on glancing sidewards to left, but not when looking straight forward or on glancing sidewards to right, the temp. meas method shews us, that a very slight additional displacement of the figures would make them correspond to a spont. nystagmus to left.

In none of the cases, here in question, can it be with certainty decided whether one of the two vestibular apparatus is sound, although in several of them this might be the case. Supposing, for example, that one of the sides was likely to give normal reaction,

there might possibly be a question of a compensating activity from the other vestibular apparatus to balance the non-equilibrium prevailing on this side. Such compensating activity, similar to the one that often occurs by the rotatory test, I have not succeeded in finding by measuring the caloric reaction by the temp. meas. method, as in cases where the caloric function was entirely suppressed on one side, and where no evidence was forthcoming to support the opinion that the other side was affected, I have found the reaction on this side quite normal. I shall now briefly go through the cases in which I have found latent non-equilibrium of the vestibular apparatus. The phenomenon does not concern to any special disease; as will be seen, it makes its appearance both through middle-ear suppurations, through syphilis, mb. meniere, and in cases of neuritis acust.

No. 63. Otitis med. chr. dupl.

20° water $\frac{10 \text{ sec.}}{15 \text{ sec.}}$ temp. meas. $\frac{+1^{\circ}.2 \div 0^{\circ}.4}{+0^{\circ}.2 \div 0^{\circ}.8}$

No. 66. Seq. otit. dupl., neurit. acust. inpr. sin.?

20° water $\frac{20 \text{ sec.}}{22 \text{ sec.}}$ temp. meas. $\frac{+2^{\circ}.3 \div 0^{\circ}.5}{+0^{\circ}.3 \div 2^{\circ}.0}$

No. 89. Syphilis.

20° water $\frac{15 \text{ sec.}}{20 \text{ sec.}}$. rot. $\frac{39 \text{ sec.}}{55 \text{ sec.}}$ temp. meas. $\frac{+2^{\circ}.5 \div 0^{\circ}.3}{+0^{\circ}.1 \div 2^{\circ}.7}$

No. 127. Syphilis.

20° water $\frac{14 \text{ sec.}}{17 \text{ sec.}}$. rot. $\frac{12 \text{ sec.}}{15 \text{ sec.}}$ temp. meas. $\frac{+1^{\circ}.5 \div 0^{\circ}.3}{+0^{\circ}.1 \div 2^{\circ}.0}$

No. 150. Mb. meniere.

20° water $\frac{13 \text{ sec.}}{10 \text{ sec.}}$. rot. $\frac{40 \text{ sec.}}{45 \text{ sec.}}$ temp. meas. $\frac{+1^{\circ}.4 \div 0^{\circ}.4}{+0^{\circ}.3 \div 1^{\circ}.1}$

No. 168. Neurit. acust. By side glance to left, nystagmus to left; by glance to right no nystagmus.

20° water $\frac{14 \text{ sec.}}{12 \text{ sec.}}$ temp. meas. $\frac{+2^{\circ}.4 \div 0^{\circ}.2}{+0^{\circ}.2 \div 1^{\circ}.0}$

No. 181. Vertigo, psychastenia.

20° water $\frac{25 \text{ sec.}}{20 \text{ sec.}}$. rot. $\frac{32 \text{ sec.}}{35 \text{ sec.}}$ temp. meas. $\frac{+2^{\circ}.6 \div 0^{\circ}.4}{+0^{\circ}.2 \div 2^{\circ}.5}$

THE MATERIAL CLASSIFIED ACCORDING TO DISEASES.

When in the following I briefly comment on my material, classified according to disease, it is chiefly in reference to a quantitative valuation, which, in my treatise, I regard as being the main issue.

The material is divided into different groups:

1) Otitis. med. chr. supp., or seq. otitis med. supp., also including individuals previously operated, viz. cases of seq. operationis radicalis. Moreover cases with other diseases besides the main disease f. i. neuritis acustica. (No. 56—85 b).
2) Syphilis, comprising all cases where syphilitic infection is ascertained, even if other ear diseases are present. (No. 86—146).
3) Morbus meniere; meaning hereby cases of ear diseases showing symptoms of dizziness occurring in fits, thus essentially keeping to the commonly established terminology, and not confining myself to those showing the classical picture of an apoplectic-like vertigo. (No. 147—162).
4) Neuritis acustica; cases of inner ear-diseases not originating from syphilis, and where dizziness does not occur in fits. (No. 163—176).
5) Vertigo; various cases of dizziness where no certain otologic diagnosis can be made, or where different diagnoses can be considered. (No. 177—182).
6) Seq. meningitidis and seq. labyrinthitidis. (No. 183—187).
7) Otosclerosis and otitis med. catarrh. chr. (No. 188—193).

Group I.

Otitis med. supp. chr., seq. otit med. supp., seq. operat. radical.

This group includes 31 cases. In 3 of them I have not had the opportunity of performing the rotatory test myself or flushing with 20° water, and where this has not been done I have thought

it preferable to leave out these tests, as probably they have not been done using the same technique, and this has less value for comparison. Neither have I made such investigations, that several authors regard as of import for determining abnormities of the vestibular apparatus, such as dizziness and nystagmus in various positions of head and body, and the different variations in the symptoms of the spontaneous and evoked nystagmus especially as regards their nature (horizontal, rotatory, vertical), or occasionally reverses caused by changes of head-position. I have thought it justifiable to confine my task to examining the mere quantitative conditions, not, however, disregarding the possibility of investigations having some trend in reference to quantitative measurings. I hope, however, I shall have occasion to communicate results of such researches, which I am already making.

I have not made comparisons with caloric testings based on previously used principles, as just in diseases of this nature the result is so very greatly influenced by extra-labyrinthine changes.

Among the 31 cases there were, in the anamnesis, complaints of dizziness in 13, out of which 9 shew pathological reaction by the temp. meas. method, that is more than $^2/_3$. Altogether 14 cases reacted pathologically, or not quite the half. 9 of these complained of dizziness (nearly $^2/_3$); whilst among the 17 reacting inside the normal limits, only 4 were found with dizziness (not quite $^1/_4$). As mentioned little was generally inquired about the nature of the dizziness, whether it arose at certain movements, positions, or occasions; thus no information or indications were to be obtained therefrom, as to whether occasionally there might be question of affections in certain archways or perhaps in the otolite organs. As at present it would seem probable that a great many cases of dizziness, by suppurative diseases of the middle ear are due to affections of the otolite organs (this matter especially studied by Mygind), and subsequently B o r r i e s, who in his dissertation, argued that the caloric reaction in every case might be determined independent of the archways; probably this entire question might be elucidated by examining clear otolitic cases be means of the temp. meas. method; as such tests would establish whether, in general, those with otolitic symptoms show abated irritability. The researches I am at present carrying out will also be done with this point in view.

Among the material there are 8 cases upon which radical operation has been performed, and of these 4 reacted more tardily than normally, i. e. exactly the half or the same proportion as that of the whole material. The appearance of temp. mem. thickenings, large or small perforations, granulations, or conditions, foreign to the vestibular apparatus, do not seem to have any influence in causing the reaction to proceed normally or tardily.

In two cases (68 & 70) fistula-symptoms were found at the time the test was made. In one of them (68) the irritability was abated, and at operation, a fistula was found on the lateral archway. In the other (70) the irritability was normal, and the operation did

not disclose any fistula. The symptom of fistula was not typical here, as by aspiration nystagmus could be evoked to the sound side alone, whereas compression did not give rise to any. In these two cases I endeavoured to discover whether an altered head of water would influence the reaction, because I observed the peculiarity that nystagmus set in alone by the mechanical effect of the water jet on the affected ears. When flushing with water of body temperature nystagmus was evoked, in one case (68) in the affected, in the other (70) in the sound side, the water jet evidently acting as a pressure, and as an aspiration respectively.

Employing as in case 68 the ordinary head, 50 ctm., (by flushing the affected right ear), nystagmus to left occurred at the temperature ÷ 2°.1; and at ÷ 0°.5 nystagmus was still found to the right. By trying the head of water at 25 ctm. the corresponding limits were ÷ 1°.6 and ÷ 0°.4 thus somewhat lower corresponding to the reduced head. When in the other case (70) there is a question of suction, one must bear in mind the flushing arrangement; the water, after having been passed through the ear, being conducted by a tube down to a bucket on the floor, it cannot be excluded that hereby a sort of siphonage is created, acting as a suction on the labyrinthine fistula; and when the distance to the floor is increased, for instance, by raising the position of the patient, the suction must be increased. By flushing the sick left ear in case 70, under the head of 50 ctm., nystagmus is obtained to left at + 1°, and at + 0°.2 nystagmus is still present to right. If now the head is lowered by 25 ctm., whereby at the same time the distance to the floor is increased equally by 25 ctm., we get the value + 1°.2 and + 0°.4, corresponding to the increase of the suction. The differences are doubtless quite small, and may not be evident, but they, however, point to the necessity of taking these occurrences into account when using the same technique as used, and especially keeping in mind, the conditions not being the same in all instances. Two other cases (64, 72) which I tested after the operation but that previously had shown fistula symptoms, and at the operation, one of them proved to have a fistula on the lateral archway, but at the time I made the test showed no symptoms. In neither of the cases tested by the temp. meas. method anything abnormal is shown. It is only in one case then, that I have found abated caloric irritability by labyrinthine fistula, but of course, my material has also been very limited to elucidate these matters. The literature quotes several cases of labyrinthine fistula, lacking caloric reaction; they are described in detail in Nylén's great work on the labyrinthine fistula.

Group II.

Syphilis.

The syphilitic inner-ear diseases have in the later years been a subject of great interest in different quarters, arising in consequence of the frequent use of salvarsan, which has caused investigations to be undertaken, resulting in making it clear, that in syphilitic inner-ear diseases these affections are present to a far greater extent than formerly supposed. The different authors have then directed their attention to this disease in order to establish, both the frequency in with changes as those referred to are likely to arise, and at which state of the disease they generally make their appearance, and finally what means are available for fighting them. Thus the later years literature on this topic is almost overwhelming. Here Robert Lund in his dissertation has treated the matter at length ,and gone through the literature published up to then. In a very great material (409 cases) he finds in about 20% disturbances in the acoustic or the vestibulo-cerebellar apparatus, or in both, so that, as to localization, the suffering in 7% of the cases referred to the acoustic apparatus, in ca: 10% to the vestibulo-cerebellar apparatus, and in 3% to both. This account is made without taking into consideration, being an acquired or congenital syphilis, also as regards to the age of the infection. Kobrak found among 106 not formerly treated syphilitics sufferings of nerv. octavus in not less than 82%, comprising 48% isolated affections of nerv. cochlearis, 28.5% isolated diseases of nerv. vestibularis, and 16.9% combined affection of both. Schlitter has been making a special study of congenital syphilis, and quotes having found here a sort of parallelism between lesions of vestibularis and cochlearis, i. e. that to a severe or light affection of nerv. vestibularis, a correspondingly severe or light affection of nerv. cochlearis appears; still he says that this parallelism is not without exceptions. Lehmann deals with the early state of syphilis, and finds that of 28 cases 75% have a lesion of nerv. octavus, which manifests itself by shortening of the bone-conduction, disturbance in the past-pointing reaction, and by anomalies in the labyrinthine irritability. It must be remarked that he only tests the rotatory function, being of the opinion that the caloric test depends upon extra-labyrinthine conditions. On the other hand, he lays stress on testing the anomalies in the pointing-reaction. Gertrud Herzfeld has also examined fresh syphilitics, and finds among 50 cases the caloric reaction supressed on one side in 3.7%, on both sides in 4.6%; the rotatory reaction suppressed in 7.1%. Besides she finds fall-reaction wanting by the caloric test in 35%, by the rotatory test in 64.3%, failing past-pointing reaction by the caloric test in 81.5%, and by the rotatory test in 91.9%. Thus, according to her investigations, not many syphilitics have uninjured vestibular apparatuses.

My material comprises a total of 61 syphilitics within all different degrees of their sickness, congenital as well as acquisitive. It

is not sufficient for a statistic account, as the cases are in a way selected, at any rate, not taken in consecutive succession. I was obliged to make a choice, as I could not manage to test by the temp. meas. method all the syphilitics who came for examination from the venereal section, and at the same time attend to my other duties. Therefore, as it was necessary to make a selection, I chose to test those who had not otherwise shown vestibular disturbances, with a view of testing, whether the temp. meas. method would indicate abnormities existing in these cases. It proved quickly to be so, and my material will therefore contain not a few of such cases, testifying that they are not at all infrequent. My material, although not suitable for statistic conclusions, may be useful in the future by pointing to the advantage of testing syphilitics in this way, thus showing changes in the irritability of the vestibular apparatus which cannot be demonstrated otherwise.

On going through the journals a greater or smaller abatement of the irritability will be found very frequently in cases where the other tests do not give occasion to suppose the existence of any abnormal condition of the vestibular apparatus, such as in all the cases, Nos. 89, 90, 93, 96, 106, 109, 113, 115, 119, 120, 121, 122, 130, 139 and 142. In a couple of them, 115 and 120, I regret having forgotten to note the result of the rotatory test, which possibly might have indicated some abnormities, but in all the rest, only the temp. meas. method shows divergence from normal conditions.

The phenomenon, the so-called dissociation between the caloric and the rotatory tests, which so often is referred to and consists in the reaction being reduced in one of the tests, but not in the other to a corresponding degree or, in its extreme form is suppressed in the one, and normal in the other, I have occasionally met with also, only when using the ordinary testing methods. But by using the temp. meas. method it proved, however, to occur very rarely. On those cases where the rotatory test shewed abated or abnormal reaction, I have found but once normal irritability-limit by testing with my method. In the former I make use of the ordinary excitant of rotating the patient 10 times in ca: 20 sec., and reckon an after-nystagmus of 20 sec. and less as being abnormal; likewise I call the case pathologic when nystagmus lasts double the time or more on one side than on the other.

Among my cases of syphilis 7 are found reacting abnormally in the rotatory test, and normally at the test with 20° water; but of these 7 cases only one (No. 103) gives normal limits also by the temp. meas. method; all the others: (nos 91, 94, 102, 114, 127, 134) show the irritability abated on one or on both sides. In the only case in my material with complete dissociation (134), where the rotatory test does not give any trace of nystagmus, while flushing with 20° water gives reaction after respectively 10 and 14 sec. the temp. meas. method shows the limits 2° and 1°.2. I shall beg to remark, that in calling the caloric reaction normal at flushing with 20° water I have reckoned with the normal limits formerly indicated, namely with respectively 8 and 21 sec.

as the extreme limits for the time of latency. Suppressed caloric reaction is not found in my material synchronously with the rotatory reaction existing, but on the other hand there are several cases where the rotatory test shows normal values, while the caloric reaction appears reduced both by flushing with 20° water, and by using the temp. meas. method. However it must be kept in mind, that the rotatory test is not a test for determining the minimal irritation, but is based on the principle of measuring the duration of the nystagmus occurring after exposure to a certain constant excitant, a method which — like the ordinary way of testing caloric irritation — might hardly bear criticism, or anyhow is not very exact. I shall not deny the existence of dissociation in that sense, that a comparatively great abatement of the irritability may appear in one way of testing, and a slight by the other, but according to my experience it occurs rather seldom that the caloric function shows itself quite unaffected, when the rotatory test indicates that abnormities exist.

The cerebro-spinal fluid is examined in 47 cases, and in 30 of them it is normal. Among these 30 the vestibular apparatus is affected in 18 cases (90, 92, 93, 96, 99, 102, 104, 106, 112, 113, 116?, 119, 122, 128?, 134, 139, 140, 141), or in ca. 60%. Among the 17 cases with pathological cerebro-spinal fluid the vestibular apparatus is affected in 10: (91, 103, 109, 114, 125, 127, 129, 132, 142, 144), or ca: 53%. Proportionally then there is about the same number of affections of vestibular apparatus among the cases with respectively normal and pathological cerebro-spinal fluids, a fact that speaks for Robert Lund being right in contending that affections of nervus vestibularis through syphilis do not depend on whether there is an affection of meninges or not.

Group III.

Mb. meniere.

In this group I have assembled 16 cases, in all but two a one-sided ear-disease combined with vertigo, occurring in spasms. The two (151, 162) have bilateral ear-disease, and perhaps do not actually belong to this group, as their illness is by no means typical; but I have placed them here on account of the dizziness being characterized by occurring in fits. In patient No. 151 there is, however, question of only two attacks on the same day, and none have appeared subsequently. He has a bilateral inner ear-disease equally pronounced on both sides. The diagnosis in this case was mb. meniere, but this was not typical. Patient No. 162 has on the section been diagnosed: »obs. for vestibular disease.« She has formerly had a middle-ear inflammation in both ears, and

now suffers from dizziness coming in fits together with a humming in the ears, and generally accompanied by vomiting. At the examination besides her middle-ear disease is found signs of affection of the inner ear, her upper tone-limit being somewhat depressed, and the hearing by bone-conduction shortened. The ordinary vestibular tests had not been considered as proving any really abnormal condition, (it will be seen though that the time of latency is lengthened on right ear); but the temp-meas. method shows, here as well as in the other case, the irritability considerably abated on both ears.

The remaining 14 cases have unilateral ear diseases, and their anamnesis are characterized by a suffering from dizziness appearing in fits, so that they may be ranked among sickness of current term: neuritis acustica unilateralis menieriformis. I have not tried to divide them into groups by testing by various means, both vaso-constricting and-dilating, as K o b r a k has done, thereby arriving at the conclusion, that the sickness may be caused by various anomalies in the vasomotor nerve system. It is upon the same researches that he has based his facies morbi: The »angioneurotic octavus-crisis«.

The 14 cases have all been examined in periods, free from fits and, only in 2 of them spontaneous nystagmus is recorded at the time of testing, which for a great part may be explained thereby, that at that time I used to leave out all cases with spont. nystagmus as not affording useful information, and not until later on did I take up also those for investigation. In these two patients where spont. nystagmus had been recorded (156, 161), it is, in the first case, directed to the healthy, in the other to the morbid side. From testing by the temp.-meas. method the result is, that in most cases the caloric irritability proved to be abated on the ear which is acoustically affected. In 5 cases (147, 153, 156, 158, 161) the irritability-limit lies within the normal, and in one (153) it is even greater on the healthy, than on the morbid side, but both limits here lie very close to the pathological, being 0°.9 and 1°.0 taking the sick and the sound ear respectively. The material shows otherwise a marked abatement of irritability for the affected ear as compared with the healthy one, although this so-called sound ear in several instances also proves to have the irritability abated. The methods used formerly do not give much indication as to such a general abatement of the irritability, as only in 4 cases (148, 152, 158, 159) the time of latency is prolonged on the affected ear. One of these (158) is among those showing normal irritability-limit, and thus the testing of the time of latency here gives a supplementary information about the affection of the vestibular apparatus. The irritability-limit is reduced also in the other 3 cases. The same, as already mentioned, takes place in several instances also regarding the so-called sound ear, but when taking an average limit as to the sound ears, and the same as to the affected ones, a comparison will show that the latter is the double of the former, the figures being respectively 0°.73 and 1°.69.

My investigations may serve to illustrate the condition of the vestibular apparatus in periods where no attacks occur. Baldenweck quotes in his work on mb. meniere that a more or less abated irritability of the vestibular apparatus prevails during »la crise vertigineuse«, that the disturbance, at its height during attacks of dizziness, is reduced in extended periods of calmness, and that it vanishes in periods of permanent convalescence. Quix writes that the labyrinthine irritability is normal between the fits, while during the same the irritability of the morbid nerv. vestibularis is suppressed. All my cases have been examined in a comparatively quiet period, but only in a few of them I have noted the time elapsed since the previous fit took place. This is the case with the patients 148 and 149, where respectively 1 year and 3 moths have passed since then. One might imagine that the vestibular apparatus should have time to calm, but in both cases the temp.-meas method shows a considerable abatement of the caloric irritability. In one of them (148) there is, moreover, a prolonged time of latency by flushing with 20° water, while No. 149 by this test shows normal figures, the same on both sides. There are, as said, 5 cases showing normal limits by the temp.-meas. method, and among these 1 has a prolonged time of latency. In 2 cases (Nos. 156, 161) there is spontaneous nystagmus which, at any rate, must suggest that the vestibular apparatus is not balanced, although this non-equilibrium may not be directly measurable. Thus only 2 cases are left where no difference in irritability on the two sides has been distinctly ascertained. These two cases have been tested with double-flushing, by which one of them (147) shows abated caloric reaction on the affected ear, while the other (153) shows vertical nystagmus upwards. Thus, when making use of all available methods of testing, one, as a rule, finds the irritability abated on the affected ear, even during periods entirely free of attacks.

Group IV.

Neuritis acustica.

Under this title I have collected 14 cases, all with affections of the inner ear, and in which no sign of syphilis has been found.

By looking through these cases it becomes obvious, that there is nothing proportional between the degree of deafness and that of the abatement of the irritability, there being instances where the sense of hearing is greatly impaired, while the irritability is normal, or only slightly abated, and vice versa, a pronounced abatement of the irritability together with a well-preserved hearing. In 4 cases the hearing was even almost natural (168, 170, 175, 176), and I tested them in the belief that the aural organs were normal.

But when then the irritability-limit proved to be abated, also a closer hearing test proved the existence of acoustic abnormities. In 6 cases there were in the anamnesis complaints of dizziness, and abated irritability was found in 4 of them (however, among these, No. 169, when spont. nystagmus occurred, and where this is the case one cannot, as mentioned above, say that the temp.-meas. method gives the right irritability-limit). Among the 8 cases without complaints of dizziness the irritability is abated in 6, thus showing that this occurs in a great number of inner-ear diseases, also when there is no syphilis, and about as frequently in cases with dizziness as without it. Demetriades & Mayer write that when testing a. m. Kobrak individuals with inner-ear diseases, but where no syphilis is present, they do not find abatement of the irritability whereas when also the labyrinth is affected, a corresponding abatement is found in the irritability. The judgment as to whether also the labyrinth is affected to them depends upon there being dizziness or nystagmus. But in this they are scarcely right, as I have found abatement of the irritability occurring just as often in either case, with or without dizziness. The time of latency does not, according to my material, give any valuable information either, as among my 14 cases there is only 1 where the time of latency is prolonged, and 2 where it is shortened; and in all these three cases, abatement of the irritability is found by the temp. meas. method. A. m. Kobrak I have tested 6 individuals (164, 165, 166, 167, 171, 172), and among these only 1 shews abated irritability, as it did not react before at 27°. This was a case without dizziness (171), where also the temp.-meas method shewed abatement, and besides this there was a case (166), which gave abnormally quick reaction, just as when flushing with 20° water. One might imagine that in the cases with dizziness there was a greater abatement of the irritability on one side than on the other, and that it was the non-equilibrium prevailing between the vestibular apparatus that induced the dizziness; but this explanation does not hold good either. On going through the cases no greater differences between the two sides is, as a rule, found in the one group than in the other, with or without dizziness.

Group V.

Vertigo.

Under this somewhat vague term I have grouped 6 cases. They all suffer from dizziness, but the illness causing it probably varies greatly in the different cases. In 3 of them there is possibly a disease in the otolite organs, as all of them (177, 178, 180) get their dizziness by certain head movements or in a certain head

position. One of them (177) has abated irritability on one ear, whilst in the others the irritability lies within the normal limits. One case (182) is diagnosed as neurasthenia, but the probability is that there is an incipient neuritis acustica, or a slight mb. meniere; there is namely a humming in one of the ears, increasing during the attacks of dizziness. However, the bone=conduction is some=what lengthened on this ear. By the temp.=meas. method a uniform abatement of the irritability is found on both ears. In all these cases the vestibular tests generally used show normal conditions. No. 179 has in the course of 5 years had 3 attacks of dizziness. The hearing is normal, excepting that the bone=conduction is shor=tened somewhat, and the upper tone=limit lowered slightly; there is spontaneous falling to right independent of head position, and also speaking troubles. Wassermann's reaction is negative, and the cerebro=spinal fluid natural. Very likely there is a question here of an intra=cranial disease although the neurological clinique has not been able to make a certain diagnosis. The rotatory test gives normal figures, and the caloric test with 20° water an ab=normally short time of latency; the temp.=meas. method normal limits. In case 181 the neurological clinique diagnosed psychastenia. The patient complains of dizziness, which has occurred spontane=ously in the later years; hearing is natural. The rotatory test shows normal figures, and testing with 20° water a lengthened time of latency on right ear. Ophthalmoscopia shows natural conditions, and the temp.=meas. method indicates a considerable abatement of the irritability on both ears, undoubtedly pointing towards an affection of the labyrinth, or of the central nerve fibres of the vestibular reflex=apparatus.

Group VI.

Seq. meningitidis, Seq. labyrintitidis.

Cases 183 and 185 suffer from ear diseases, said to originate from meningitis. No. 183 is excessively deaf on left ear, and to=tally on the right after meningitis, from which he recovered at the age of 1½ years. He is now 48 years old, does not suffer from dizziness. By the caloric test with 20° water, reaction is obtained on right ear after 45 sec., on left ear after 32 sec. By the temp. meas. method the limits are found to be on left side: + 2°.8 and ÷ 2°.2; on right side, the limit for cold excitation is ÷ 13°.7, for warm excitation it was not measurable as being above the tem=perature at which flushing are practicable. No. 185 had cerebro=spinal meningitis 4 years ago, and was deaf on both ears for some time subsequently. The left ear recovered within some months,

whereas the right remained deaf. He now constantly suffers from disturbances of equilibrium and cannot walk steadily in darkness. At present he hears normally with left ear. The rotatory test gives hardly any reaction, only nystagmus of a few seconds duration; flushing with 20° water gives reaction after respectively 22 sec. and 19 sec., i. e. about normal figures. The temp. meas. method thus shows on right side the limits + 5°.6 and ÷ 2°.6, an enormous abatement of the irritability; on left side + 0°.4 and ÷ 1°. This result points to Kleyn & Versteegh being right in conjecturing no marked difference in the vulnerability of nerv. acusticus and nerv. vestibularis, and that, when such a difference was formerly supposed to exist, the reason was that at the time in question one could not measure the function of nerv. vestibularis as accurately as that of nerv. acusticus. Nos. 184 and 186 have had postoperative unilateral labyrinthitis with completely suppressed acoustic and vestibular function on the operated ear. In both cases the temp. meas. method shows normal irritability limits on the sound ear. No. 187 has about a year prior to the examination gone through a sickness causing him to suffer for two days from dizziness and vomitings, and resulting in total deafness on right ear. Later he has, now and then, some dizziness, but no attacks. He was himself of the opinion that the cause was «flu«, but the probability is that this was a labyrinthitis of an unknown origin. He is now totally deaf on right ear, while the hearing on left is, in itself, normal, although with a slightly shortened bone-conduction. Rotation proves shortened after-nystagmus, and flushing with 20° water a slight abatement of the irritability, the time of latency being 22 and 23 sec. The temp. meas. method gives as to the deaf right ear the limits + 2° and ÷ 1°.6, and for the left ear + 0°.6 and ÷ 0°.8, indicating a rather severe lesion of nerv. vestibularis on right side, and a slight one on the left.

Group VII.

Otosclerosis. Otit. med. catarrh. chr.

Among otosclerosis patients in rather a great many cases one must expect to find changes in the vestibular irritability. Dizziness, as known occurs comparatively often in otosclerosis, and the pathologic-anatomic investigations show that the metaplastic ostitis, causing the disease, often extends to the vestibular part of the labyrinth. Among the 5 patients with otosclerosis tested, 2 complained of dizziness (189, 193); both however have shown normal irritability limits. In two others (188, 190) it is abated; but referring to the first of them nothing has been noted in the journal as to dizziness. The other did not suffer from it, but presented the peculiarity

that nystagmus occurred whenever the apparatus was applied to the right ear, thus indicating a sort of reflectory nystagmus or maybe a nystagmus »readiness«. Thus the result of examining the patients with otosclerosis is not very encouraging, at this juncture, as abated irritability is found in cases without dizziness, and normal irritability in cases with dizziness, and it may also seem surprising that the abatement of the irritability is rather slight in cases where it occurs, in spite of the hearing faculty being affected considerably, which might however indicate a rather advanced state of the disease.

In the one case with otitis catarrhalis chron, normal irritability limits were found.

THE MATERIAL.

To the record of the tests I shall submit the following explanations.

In the fractions the figures referring to testing the right ear are written above the line, and those referring to the left ear are placed below.

For whispering-test (whisp.) the distance is given in meters; a. c. and b. c. mean air- and bone-conduction, referring to hearing by transmission respectievly through air and bone, using a tuning-fork: a_1. L. l. and u. l. mean lower and upper tone-limit; the latter measured with Galton's whistle. Unfortunately I was, while testing, placed at some disadvantage through my Galton's whistle, but as a rule the normal upper tone-limit is expressed by the figures 1.0—1.4, which, according to the accompanying table are those corresponding to the numbers of oscillation 25.000—22.000.

By the test with 20° water the first figure refers to time of latency and the figure placed after dur. (duration) shows the duration of nystagmus.

By the rotatory test (Rot.) the numerator shows the number of seconds that nystagmus to right lasts after rotation to left; the denominator is the corresponding number of seconds of nystagmus to left after rotation to right (the rotation is 10 times in ca: 20 sec.).

As to the figures referring to the temp. meas. method (temp. meas.) explanation is already given above. M. and f. mean man and woman. A. d. and a. s. mean right and left ear.

As already mentioned, minus is shewn as $\div$.

Normal individuals.

No. 1. f. aged 16.

20° water $\frac{\text{11 sec. dur. 124 sec.}}{\text{12 sec. dur. 130 sec.}}$ temp. meas. $\frac{+0°.5 \div 0°.3}{+0°.4 \div 0°.3}$

inject. chloret morph. 0.01 administered, and 1 hour later:

Temp. meas. $\frac{+0°.3 \div 0°.3}{+0°.5 \div 0°.3}$

No. 2. f. aged 15.

20° water $\frac{\text{17 sec. dur. 140 sec.}}{\text{15 sec. dur. 123 sec.}}$ 5 ccm. 35° $\frac{\text{35 sec. (dubious).}}{\text{18 sec.}}$

Temp. meas $\frac{+0°.2 \div 0°.6}{+0°.2 \div 0°.6}$

No. 3. f. aged 17.

20° water $\frac{\text{12 sec. dur. 131 sec.}}{\text{9 sec. dur. 132 sec.}}$ temp. meas. $\frac{+0°.3 \div 0°.3}{+0°.3 \div 0°.3}$

No. 4. aged 17.

20° water $\frac{\text{10 sec. dur. 165 sec.}}{\text{15 sec. dur. 115 sec.}}$. rot. $\frac{\text{30 sec.}}{\text{35 sec.}}$ temp. meas. $\frac{+0°.4 \div 0°.3}{+0°.3 \div 0°.4}$

No. 5. f. aged 29.

20° water $\frac{\text{11 sec. dur. 104 sec.}}{\text{14 sec. dur. 114 sec.}}$ temp. meas. $\frac{+0°.1 \div 0°.7}{+0°.3 \div 0°.5}$

No. 6. f. aged 36.

20° water $\frac{\text{15 sec. dur. 120 sec.}}{\text{13 sec. dur. 105 sec.}}$ temp. meas. $\frac{+0°.3 \div 0°.3}{+0°.3 \div 0°.4}$

No. 7. m. aged 23.

20° water $\frac{\text{10 sec. dur. 127 sec.}}{\text{11 sec. dur. 126 sec.}}$ temp. meas. $\frac{+0°.3 \div 0°.3}{+0°.3 \div 0°.3}$

No. 8. f. aged 23.

temp. meas. $\frac{+0°.2 \div 0°.6}{+0°.2 \div 0°.7}$

No. 9. f. aged 23.

20° water $\frac{\text{10 sec. dur. 104 sec.}}{\text{11 sec. dur. 123 sec.}}$ temp. meas. $\frac{+0°.5 \div 0°.3}{+0°.3 \div 0°.3}$

No. 10. f. aged 17.

20° water $\frac{\text{12 sec. dur. 116 sec.}}{\text{11 sec. dur. 114 sec.}}$ temp. meas. $\frac{+0°.1 \div 0°.7}{+0°.1 \div 0°.7}$

No. 11. f. aged 12.

20° water $\frac{\text{10 sec. dur. 114 sec.}}{\text{13 sec. dur. 125 sec.}}$ temp. meas. $\frac{+\,0°.4 \div 0°.4}{+\,0°.2 \div 0°.6}$

No. 12. f. aged 24.

20° water $\frac{\text{13 sec. dur. 129 sec.}}{\text{14 sec. dur. 127 sec.}}$ temp. meas. $\frac{+\,0°.2 \div 0°.7}{+\,0°.2 \div 0°.7}$

No. 13. f. aged 26.

20° water $\frac{\text{17 sec. dur. 105 sec.}}{\text{16 sec. dur. 103 sec.}}$ rot. $\frac{\text{34 sec.}}{\text{32 sec.}}$ temp. meas. $\frac{+\,0°.3 \div 0°.4}{+\,0°.3 \div 0°.5}$

No. 14. m. aged 51.

20° water $\frac{\text{10 sec. dur. 110 sec.}}{\text{12 sec. dur. 112 sec.}}$ temp. meas. $\frac{+\,0°.1 \div 0°.8}{+\,0°.1 \div 0°.7}$

No. 15. f. aged 22.

20° water $\frac{\text{10 sec. dur. 125 sec.}}{\text{12 sec. dur. 145 sec.}}$ temp. meas. $\frac{+\,0°.3 \div 0°.5}{+\,0°.3 \div 0°.5}$

No. 16. f. aged 36.

20° water $\frac{\text{10 sec. dur. 120 sec.}}{\text{12 sec. dur. 124 sec.}}$ temp. meas. $\frac{+\,0°.2 \div 0°.5}{+\,0°.1 \div 0°.5}$

No. 17. m. aged 16.

20° water $\frac{\text{12 sec. dur. 124 sec.}}{\text{10 sec. dur. 105 sec.}}$

5 ccm. 35° $\frac{\text{18 sec.}}{\div,\ 1 \text{ min. later again 5 ccm., than } + \text{ after 20 sec.}}$

10 ccm. 35° $\frac{\text{——}}{\text{30 sec.}}$ temp. meas. $\frac{+\,0°.3 \div 0°.3}{+\,0°.4 \div 0°.4}$

No. 18. f. aged 17.

20° water $\frac{\text{15 sec. dur. 131 sec.}}{\text{12 sec. dur. 122 sec.}}$ temp. meas. $\frac{+\,0°.3 \div 0°.3}{+\,0°.2 \div 0°.4}$

No. 19. f. aged 57.

20° water $\frac{\text{15 sec. dur. 175 sec.}}{\text{16 sec. dur. 185 sec.}}$ temp. meas. $\frac{+\,0°.2 \div 0°.7}{+\,0°.3 \div 0°.7}$

No. 20. m. aged 17.

20° water $\frac{\text{16 sec. dur. 115 sec.}}{\text{17 sec. dur. 120 sec.}}$ temp. meas. $\frac{+\,0°.1 \div 0°.5}{+\,0°.1 \div 0°.5}$

No. 21. m. aged 16.

Temp. meas. $\frac{+0°.3 \div 0°.4}{+0°.2 \div 0°.3}$

No. 22. m. aged 44.

20° water $\frac{9 \text{ sec. dur. } 136 \text{ sec.}}{11 \text{ sec. dur. } 134 \text{ sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.2}{+0°.2 \div 0°.4}$

No. 23. m. aged 24.

20° water $\frac{15 \text{ sec. dur. } 160 \text{ sec.}}{15 \text{ sec. dur. } 135 \text{ sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.6}{+0°.1 \div 0°.5}$

No. 24. f. aged 24.

20° water $\frac{12 \text{ sec. dur. } 110 \text{ sec.}}{13 \text{ sec. dur. } 85 \text{ sec.}}$ temp. meas. $\frac{+0°.3 \div 0°.3}{+0°.2 \div 0°.3}$

1 ccm. 35° $\frac{19 \text{ sec.}}{24 \text{ sec.}}$

No. 25. m. aged 19.

20° water $\frac{10 \text{ sec. dur. } 122 \text{ sec.}}{13 \text{ sec. dur. } 153 \text{ sec.}}$ 5 ccm. 35° $\frac{10 \text{ sec.}}{11 \text{ sec.}}$

Temp. meas. $\frac{+0°.2 \div 0°.5}{+0°.3 \div 0°.3}$

No. 26. f. aged 21.

Temp. meas. $\frac{+0°.3 \div 0°.5}{+0°.3 \div 0°.5}$ 1 hour after inj. chlor. morph. 1.5 ctgr.

$\frac{+0°.3 \div 0°.5}{+0°.2 \div 0°.5}$

No. 27. m. aged 18.

20° water $\frac{8 \text{ sec. dur. } 125 \text{ sec.}}{9 \text{ sec. dur. } 121 \text{ sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.2}{+0°.2 \div 0°.2}$

No. 28. m. aged 19.

20° water $\frac{17 \text{ sec. dur. } 118 \text{ sec.}}{21 \text{ sec. dur. } 109 \text{ sec.}}$

5 ccm. 35° $\frac{15 \text{ sec., } 75 \text{ sec. later again 5 ccm., ny. after 15 sec.}}{20 \text{ sec., } 45 \text{ sec. later again 5 ccm., ny. after 14 sec.}}$

Temp. meas. $\frac{+0°.4 \div 0°.2}{+0°.4 \div 0°.2}$

immediately after flushing again left ear 5 ccm. 35°, nystagmus after 16 sec.

No. 29. m. aged 19.

20° water $\frac{\text{16 sec. dur. 130 sec.}}{\text{15 sec. dur. 138 sec.}}$ temp. meas. $\frac{+0°.4 \div 0°.3}{+0°.2 \div 0°.4}$

No. 30. f. aged 35.

20° water $\frac{\text{12 sec. dur. 125 sec.}}{\text{10 sec. dur. 135 sec.}}$ 5 ccm. 35° $\frac{\text{14 sec.}}{\text{24 sec.}}$

Temp. meas. $\frac{+0°.3 \div 0°.5}{+0°.3 \div 0°.5}$

No. 31. m. aged 18.

20° water $\frac{\text{14 sec. dur. 117 sec.}}{\text{14 sec. dur. 134 sec.}}$ 5 ccm. 35° $\frac{\text{22 sec.}}{\text{16 sec.}}$

Temp. meas. $\frac{+0°.3 \div 0°.3}{+0°.3 \div 0°.2}$

No. 32. m. aged 20.

20° water $\frac{\text{16 sec. dur. 132 sec.}}{\text{13 sec. dur. 147 sec.}}$

5 ccm. 35° $\frac{\text{28 sec.}}{\text{28 sec., shortly after again 5 ccm., then ny. after 29 sec.}}$

Temp. meas. $\frac{+0°.4 \div 0°.3}{+0°.4 \div 0°.4}$

No. 33. f. aged 31.

20° water $\frac{\text{10 sec. dur. 120 sec.}}{\text{11 sec. dur. 126 sec}}$ temp. meas. $\frac{+0°.1 \div 0°.9}{+0°.1 \div 0°.8}$

No. 34. m. aged 14.

20° water $\frac{\text{15 sec. dur. 160 sec.}}{\text{16 sec. dur. 125 sec.}}$ 5 ccm. 35° $\frac{\text{17 sec.}}{\text{24 sec.}}$

Temp. meas. $\frac{+0°.4 \div 0°.4}{+0°.2 \div 0°.5}$

next day l. ear tested without preceeding flushing, with + 0.2, reacts immediately.

No. 35. f. aged 68.

20° water $\frac{\text{17 sec. dur. 191 sec.}}{\text{18 sec. dur. 202 sec.}}$

5 ccm. 35° $\frac{\text{20 sec., 1 min. later again 5 ccm., then ny. after 18 sec.}}{\text{14 sec., 1 min. later again 5 ccm., then ny. after 15 sec.}}$

Temp. meas. $\frac{+0°.4 \div 0°.6}{+0°.4 \div 0°.5}$

No. 36. f. aged 17.

Temp. meas. $\frac{+\,0\,^{0}.1 \div 0\,^{0}.7}{+\,0\,^{0}.3 \div 0\,^{0}.5}$

No. 37. m. aged 44.

20° water $\frac{14 \text{ sec. dur. } 133 \text{ sec.}}{18 \text{ sec. dur. } 141 \text{ sec.}}$ temp. meas. $\frac{+\,0\,^{0}.4 \div 0\,^{0}.4}{+\,0\,^{0}.1 \div 0\,^{0}.6}$

No. 38. m. aged 22.

20° water $\frac{13 \text{ sec. dur. } 136 \text{ sec.}}{12 \text{ sec. dur. } 127 \text{ sec.}}$ 5 ccm. 35° $\frac{24 \text{ sec.}}{16 \text{ sec.}}$

Temp. meas. $\frac{+\,0\,^{0}.3 \div 0\,^{0}.5}{+\,0\,^{0}.5 \div 0\,^{0}.3}$

inj. chl. morph. 1.5 ctgr. and ½ hour later: Temp. m. $\frac{+\,0\,^{0}.4 \div 0\,^{0}.3}{+\,0\,^{0}.3 \div 0\,^{0}.3}$

No. 39. m. aged 28.

20° water $\frac{8 \text{ sec. dur. } 142 \text{ sec.}}{10 \text{ sec. dur. } 111 \text{ sec.}}$ 5 ccm. 35° $\frac{13 \text{ sec.}}{11 \text{ sec.}}$

Temp. meas. $\frac{+\,0\,^{0}.3 \div 0\,^{0}.3}{+\,0\,^{0}.3 \div 0\,^{0}.5}$

No. 40. f. aged 46.

20° water $\frac{11 \text{ sec. dur. } 131 \text{ sec.}}{15 \text{ sec. dur. } 137 \text{ sec.}}$ temp. meas. $\frac{+\,0\,^{0}.6 \div 0\,^{0}.3}{+\,0\,^{0}.4 \div 0\,^{0}.4}$

No. 41. f. aged 32.

20° water $\frac{15 \text{ sec. dur. } 117 \text{ sec.}}{10 \text{ sec. dur. } 129 \text{ sec.}}$ temp. meas. $\frac{+\,0\,^{0}.2 \div 0\,^{0}.3}{+\,0\,^{0}.2 \div 0\,^{0}.2}$

No. 42. f. aged 41.

20° water $\frac{10 \text{ sec. dur. } 113 \text{ sec.}}{9 \text{ sec. dur. } 107 \text{ sec.}}$ 5 ccm. 35° $\frac{14 \text{ sec.}}{12 \text{ sec.}}$

Temp. meas. $\frac{+\,0\,^{0}.1 \div 0\,^{0}.5}{+\,0\,^{0}.2 \div 0\,^{0}.5}$

Nr. 43. f. aged 15.

20° water $\frac{8 \text{ sec. dur. } 145 \text{ sec.}}{11 \text{ sec. dur. } 152 \text{ sec.}}$ temp. meas. $\frac{+\,0\,^{0}.3 \div 0\,^{0}.3}{+\,0\,^{0}.1 \div 0\,^{0}.4}$

No. 44. m. aged 42.

20° water $\frac{15 \text{ sec. dur. } 134 \text{ sec.}}{15 \text{ sec. dur. } 138 \text{ sec.}}$ temp. meas. $\frac{+\,0\,^{0}.2 \div 0\,^{0}.5}{+\,0\,^{0}.1 \div 0\,^{0}.3}$

No. 45. m. aged 18.

20° water $\frac{\text{18 sec. dur. 145 sec.}}{\text{17 sec. dur. 155 sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.6}{+0°.2 \div 0°.7}$

No. 46. f. aged 21.

20° water $\frac{\text{14 sec. dur. 125 sec.}}{\text{12 sec. dur. 149 sec.}}$

5 ccm. 35° $\frac{\text{24 sec., 1 min. later again 5 ccm., then ny. after 18 sec.}}{\text{22 sec., 1 min. later again 5 ccm., then ny. after 15 sec.}}$

Temp. meas. $\frac{+0°.4 \div 0°.3}{+0°.3 \div 0°.4}$

No. 47. f. aged 17.

20° water $\frac{\text{10 sec. dur. 115 sec.}}{\text{11 sec. dur. 150 sec.}}$ temp. meas. $\frac{+0°.4 \div 0°.2}{+0°.4 \div 0°.2}$

No. 48. m. aged 55.

Temp. meas. $\frac{+0°.2 \div 0°.2}{+0°.2 \div 0°.3}$ 5 ccm. 35° $\frac{\div}{\div}$ 10 ccm. $\frac{}{\text{36 sec.}}$

immediately after temp. meas. l. ear again reaction for 10 ccm. 35° after 36 sec.

No. 49. f. aged 16.

20° water $\frac{\text{14 sec. dur. 114 sec.}}{\text{12 sec. dur. 140 sec.}}$ temp. meas. $\frac{+0°.0 \div 0°.8}{+0°.2 \div 0°.2}$

No. 50. m. aged 21.

20° water $\frac{\text{14 sec. dur. 135 sec.}}{\text{11 sec. dur. 160 sec.}}$ temp. meas. $\frac{+0°.0 \div 0°.8}{+0°.0 \div 0°.4}$

No. 51. f. aged 19.

20° water $\frac{\text{10 sec. dur. 154 sec.}}{\text{12 sec. dur. 156 sec.}}$ temp. meas. $\frac{+0°.0 \div 0°.3}{+0°.1 \div 0°.3}$

No. 52. f. aged 18.

20° water $\frac{\text{12 sec. dur. 143 sec.}}{\text{14 sec. dur. 140 sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.3}{+0°.2 \div 0°.5}$

No. 53. f. aged 23.

Temp. meas. $\frac{+0°.1 \div 0°.9}{+0°.1 \div 0°.7}$

No. 54. m. aged 19.

20° water $\frac{\text{12 sec. dur. 109 sec.}}{\text{12 sec. dur. 121 sec.}}$ temp. meas. $\frac{+\,0°.3 \div 0°.5}{+\,0°.1 \div 0°.5}$

No. 55. f. aged 17.

Temp. meas. $\frac{+\,0°.3 \div 0°.4}{+\,0°.2 \div 0°.5}$

Journals.

No. 56. (sect. 3852) f. 19 years.

From 7 ears of age got outflow from right ear; never headache, dizziness or vomiting; a. d. stinking pus; almost total defect of drum membrane; labyrinth wall granulated; a. s. natural.

Whisp. $\frac{0.05}{> 8.00}$. A.c. $\frac{9 \text{ sec.}}{45 \text{ sec.}}$. B.c. $\frac{10 \text{ sec.}}{15 \text{ sec.}}$. Rinne $\frac{\div}{+}$

Weber $\downarrow$, l.l. $\frac{40}{16}$

20° water $\frac{\text{11 sec. dur. } 95 \text{ sec.}}{\text{11 sec. dur. } 100 \text{ sec.}}$ rot. $\frac{15 \text{ sec.}}{15 \text{ sec.}}$ temp. meas. $\frac{+\,0°.4 \div 0°.5}{+\,0°.3 \div 0°.5}$

No. 57. (sect. 3876) m. 22 years.

From early childhood suffered from discharge from both ears. Never dizziness. Removed to section 25/11 21; there were then polypus formations in both ears. No spontaneous nystagmus. On flushing with 20° water typical reaction on both sides after a couple of min. (reaction retarded on account of the polypi). Had 30/11 an fit of dizziness and falling tendency to right, but no spont. nystagmus or past-pointing shortly after the fit. The 2/12 radical operation performed on right side; 16/12 same on left side, whereupon paresis facialis. Both cavities are now, at the time the examination is carried out, (9/1 22) in good improvement. There is in optimum position and with Bartel's glasses, a weak spont. nystagmus to left; not constant though except during flushing for the temp.-meas. test, where it is constant even when the flushing is performed at temperatures, which ought to counteract it.

5 ccm. 35° $\frac{14 \text{ sec.}}{\div \text{ nyst.}}$. 10 ccm. 35° $\frac{\quad}{22 \text{ sec.}}$. rot. $\frac{33 \text{ sec.}}{28 \text{ sec.}}$

Temp. meas. $\frac{+\,2°.2 + 1°.0}{\div 0°.6 \div 1°.2}$

No. 58. (sect. 3643) m .23 years.

Has outflow from right ear for 4—5 years; no pains or dizziness; a. d. bad-smelling secretion, limbic perforation behind in tymp. mem. a. s. natural.

Whisp. $\frac{3.00}{> 8.00}$. A.c. $\frac{30 \text{ sec.}}{60 \text{ sec.}}$. B. c. $\frac{20 \text{ sec.}}{29 \text{ sec.}}$. Rinne $\frac{+}{+}$

No spont. nystagmus, no fistula symptom.

20 ° water $\frac{7 \text{ sec. dur. } 115 \text{ sec.}}{17 \text{ sec. dur. } 131 \text{ sec.}}$. rot. $\frac{38 \text{ sec.}}{40 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.6 \div 0\,°.2}{+ 0\,°.2 \div 0\,°.2}$

No. 59. (sect. 3604) m. 29 years.

Since childhood discharge from left ear; in the last $^3/_4$ year dizziness; a. d. natural, a. s. stinking pus, great perforation of tymp. mem. in front and downwards, full of desquamations.

Whisp. $\frac{> 8.00}{0.30}$. A.c. $\frac{45 \text{ sec.}}{10 \text{ sec.}}$. B .c. $\frac{25 \text{ sec.}}{20 \text{ sec.}}$. Rinne $\frac{+}{\div}$. Weber?

No spont. nystagmus. Temp. meas. $\frac{+ 0\,°.2 \div 0\,°.4}{+ 0\,°.1 \div 0\,°.4}$. Being insane he is not examined very closely.

No. 60. (sect. 3863) m. 37 years.

Has 2 years had double sided outflow. During the latter half year, and last time two months ago, has had fits of dizziness with rotation-feelings to right. Never vomitings. Together with the dizziness he has headache and increased deafness.

A. d. stinking secretion. From the rear part of mem. shrapnel an oblong polypus large as a pea. The front part of tymp. mem. is cicatricial. a. s. stinking secretion; tymp. mem. red and swollen, upwards and in front is seen adherent detritus.

Whisp. $\frac{0.30}{0.38}$. A.c. $\frac{14 \text{ sec.}}{15 \text{ sec.}}$. B.c. $\frac{17 \text{ sec.}}{6 \text{ sec.}}$. Rinne $\frac{\div}{+}$ l.l. $\frac{65}{65}$ u. l. $\frac{2.7}{2.7}$

No spont. nystagmus or past-pointing. No fistula symptoms.

17/11 21 20-° water $\frac{32 \text{ sec. dur. } 125 \text{ sec.}}{18 \text{ sec. dur. } 110 \text{ sec.}}$ rot. $\frac{31 \text{ sec.}}{28 \text{ sec.}}$

Temp. meas. $\frac{+ 2\,°.1 + 1\,°.0}{+ 0\,°.5 + 1\,°.5}$

When the apparatus in temp.-measuring is applied to the auditory canal spont. nystagmus is obtained to the opposite side, hence the strange values resulting from the test.

18/11 21 radical operation on right ear, thereafter a labyrinthitis dext. 20/12 21 still a slight spont. nystagmus to left, and then by the temp.-meas. method $\frac{+ 1\,°.7 + 0\,°.7}{+ 0\,°.1 \div 0\,°.7}$. After treatment of the right radically operated ear with cocaine-adrenaline is within 20 min. found temp. meth. $+ 1\,°.7 + 0\,°.7$

No. 61. (sect. 3911) m. 47 years. Seq. otit. supp. duplex.

The mother and her family are hard of hearing; he has been thus from the age of five years. Got at eighteen years an outflow from left ear, but this quickly got better. At 36 years got discharge from

right ear, which lasted 7 years. The deafness has increased steadily. He is very nervous (has taken part in the great war). Two months ago again outflow from left ear. Never vestibular symptoms.

Whisp. $\frac{0.05}{\text{a.a.}}$. A.c. $\frac{18\text{ sec.}}{0}$. B. c. $\frac{7\text{ sec.}}{10\text{ sec.}}$. Rinne $\frac{+}{\div}$

Weber $\uparrow$ 1.1. $\frac{55}{90}$ u. l. $\frac{13000}{14000}$

No spont. nystagmus, past-pointing or falling tendency.

20° water $\frac{10\text{ sec. dur. }112\text{ sec.}}{8\text{ sec. dur. }110\text{ sec.}}$ rot. $\frac{45\text{ sec.}}{32\text{ sec.}}$

5 ccm. 35° $\frac{13\text{ sec.}}{13\text{ sec.}}$ temp. meas. $\frac{+\,0°.4 \div 0°.6}{+\,0°.6 \div 0°.2}$

The following day right ear is, without previous flushing, tried with $\div$ 0°.5, whence nystagmus is got to left. After pausing 5 min. again tried with + 0°.4 which gives nystagmus to right. After a pause of 15 min. left ear gives nystagmus to right for $\div$ 0°.3. Three min. later no nystagmus for + 0°.5 at left ear, and again 4 min. later nystagmus to left for + 0°.7.

No. 62. (sect. 3837) f. 21 years. Otit. chr. supp. dx., meningitis serosa. Operat. radicalis dx.

Has been in the department from 1/3 to 8/5 1921 for otit. chr. supp. dx., meningitis serosa. Radic. oper., lumbar punct., craniotomia, cerebral and cerebellar punct. The cerebro-spinal lymph shews slight growth of the cells (18/3) and strongly increased pressure (5—600 mm.). There was considerably choked disc; subsequently (7/11 21) only effaced papillae-edges, without actual choked disc. Cerebro-spinal fluid contains now 13/3 cells; the pressure is 450 mm. There is no dizziness. A. d. partly epidemised operation-cavity. a. s. tymp. mem. retracted.

Whisp. $\frac{\text{a.a. (Ba)}}{> 800}$. A.c. $\frac{11\text{ sec.}}{29\text{ sec.}}$. B. c. $\frac{19\text{ sec.}}{15\text{ sec.}}$. Rinne $\frac{\div}{+}$

Weber $\rightarrow$ 1. $\frac{100}{16}$ u. l. $\frac{20{,}000}{25{,}000}$

No spont. nystagmus, but spont. falling backwards, independent of head position.

20° water $\frac{10\text{ sec.}}{12\text{ sec.}}$. rot. $\frac{35\text{ sec.}}{35\text{ sec.}}$ temp. meas. $\frac{+\,0°.1 \div 0°.5}{+\,0°.3 \div 0°.3}$

No. 63. (sect. 3862) f. 20 years. Otit. med. chr. supp. duplex.

From two years had bilateral ear discharge, which has continued since with short interruptions. The outflow has for many years been stinking. Apart from a little dizziness during the journey to the hospital she has never suffered from vertigo.

a. d. and s. tymp. mem. red, swollen, woth little perforation anteriorly downwards, stinking pus.

Whisp. $\frac{10.00}{11.00}$ rot. $\frac{14\text{ sec.}}{14\text{ sec.}}$ l. l. $\frac{24}{22}$ u. l. $\frac{2.8}{3.7}$. No spont. nyst.

20 ° water $\frac{10\text{ sec. dur. }155\text{ sec.}}{15\text{ sec. dur. }132\text{ sec.}}$ temp. meas. $\frac{+1\,°.2 \div 0\,°.4}{+0\,°.2 \div 0\,°.8}$

No. 64. (sect. 3557) m. 28 years seq. operationis radicalis sin. fistula labyrinthi?

Radical operation on left ear two months ago, it had been flowing a month. Previous to the operation spont. nystagmus to left. On pressure in left ear passage got a change of nystagmus to right. By aspiration nystagmus to left. Presently (21/5 1921) no spont. nystagmus.

20 ° water $\frac{20\text{ sec. dur. }127\text{ sec.}}{50\text{ sec. dur. }90\text{ sec.}}$ temp. meas. $\frac{+0\,°.1 \div 0\,°.8}{+0\,°.2 \div 0\,°.7}$

10/3 21. Whisp. $\frac{> 8.00}{0.40\text{ (Ba)}}$. A.c. $\frac{60\text{ sec.}}{10\text{ sec}}$. B. c. $\frac{25\text{ sec.}}{25\text{ sec.}}$. Rinne $\frac{+}{\div}$

Weber ↓ l.l. $\frac{16}{100}$ u. l. $\frac{0.5}{1.0}$

No. 65. (sect. 3707) f.2 2 years. Otit. med. supp. chr. dupl.

Had 4 years old bilateral ear disease, and every now and then outflow when taking cold. Never dizziness or cerebral fits. a. d. ill smelling pus, granulations downwards and to the rear; at present no secretion. a. s. great perforation, no secretion.

Whisp. $\frac{1{,}00}{0{,}10}$. Speak t. $\frac{3{,}00}{1{,}00}$. A.c. $\frac{23\text{ sec.}}{15\text{ sec.}}$. B. c. $\frac{18\text{ sec.}}{19\text{ sec.}}$

Rinne $\frac{\div}{\div}$. Weber ↓.

20 ° water $\frac{12\text{ sec. dur. }133\text{ sec.}}{12\text{ sec. dur. }117\text{ sec.}}$ rot. $\frac{32\text{ sec.}}{35\text{ sec.}}$ temp. meas. $\frac{+0\,°.6 \div 0\,°.2}{+0\,°.2 \div 0\,°.2}$

No spont. nystagmus.

No. 66. (sect. 3806) f. 37 years. seq. otit. supp. dupl, neurit. acustic.

Treated in the department for polypi nasi. Had 20 years ago outflow from left ear; 6—7 years ago same from right ear; since now and then from both; some hard-hearing on left ear; never dizziness or humming in the ears.

a. d. and. s. tymp. mem. cicatricial with a great calcium-infiltration.

Whisp. $\frac{8{,}00}{0{,}10}$. A.c. $\frac{34\text{ sec.}}{25\text{ sec.}}$. B. c. $\frac{10\text{ sec.}}{10\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber ↑ l.l. $\frac{16}{16}$ u. l. $\frac{2.9}{5.2}$

20 ° water $\frac{20\text{ sec. dur. }110\text{ sec.}}{22\text{ sec. dur. }95\text{ sec.}}$ rot. $\frac{25\text{ sec.}}{25\text{ sec.}}$ temp. meas. $\frac{+0\,°.3 \div 0\,°.5}{+0\,°.3 \div 2\,°.0}$

No spont. nystagmus.

No. 67. (sect. 3750) f. 26 years. Otit. med. chr. supp. sin.

Got at 13 years old a left-sided facial paresis, which disappeared some time after. When 15 years old a pea-sized polypus ascertained in left ear, it was removed, but has often shown recidivity, and ever since stinking outflow from the ear. Six years ago facial paresis reappeared, and it is not yet quite healed. Never dizziness or headache.

a. d. tymp .mem. retracted. a s. evil-smelling pus, big perforation downwards and in front, labyrinth wall covered with detritus.

Whisp. $\frac{> 13.00}{0.75}$. A.c. $\frac{39 \text{ sec.}}{14 \text{ sec.}}$. B. c. $\frac{10 \text{ sec.}}{9 \text{ sec.}}$. Rinne $\frac{+}{+}$

Weber $\downarrow$. l.l. $\frac{16}{28}$ u. l. $\frac{22.000}{22.000}$

20 ° water $\frac{15 \text{ sec. dur.}}{13 \text{ sec. dur.}}$ $\frac{140 \text{ sec.}}{136 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.5 \div 0\,°.4}{+ 0\,°.3 \div 0\,°.3}$

No. 68. (sect. 3789) m. 40 years. Otit. med. supp. chr. dex., fistula labyrinthi.

Right ear discharging from his 9th to 10th year. Never dizziness before the day preceding that of admission when becoming dizzy in the morning, especially by movements of the head. a. d. stinking pus. a. s. tymp. mem. retracted.

Whisp. $\frac{\text{a.a. (Ba)}}{> 13.00}$. A.c. $\frac{11 \text{ sec.}}{51 \text{ sec.}}$. B. c. $\frac{13 \text{ sec.}}{13 \text{ sec.}}$. Rinne $\frac{\div}{+}$

Weber $\uparrow$. l.l. $\frac{45}{16}$ u. l. $\frac{2.4}{1.2}$

By pressure in right auditory canal a powerful nystagmus to right. No spontaneous nystagmus by looking straight out; by glancing sidewards nystagmus to same sides respectively.

20 ° water $\frac{21 \text{ sec. dur.}}{18 \text{ sec. dur.}}$ $\frac{177 \text{ sec.}}{160 \text{ sec.}}$. rot. $\frac{30 \text{ sec.}}{23 \text{ sec.}}$

Temp. meas. $\frac{\div 0\,°.5 \div 2\,°.1}{+ 0\,°.2 + 0\,°.9}$ (fall 50 ctm.).

Temp. meas. $\frac{\div 0\,°.4 \div 1\,°.6}{+ 0\,°.0 \div 0\,°.8}$ (fall 25 ctm.).

At the operation an oblong fistula is found on the lateral archway full of cholesteatoma. By pressing the sound in the fistula nystagmus is got to left.

No. 69. (sect. 3699) f. 22 years. Otit. med. chr. supp. sin.

Scarlatina at 8 years age since then got outflow from left ear; it has continued since and has grown worse in the latter half year. She never had dizziness. a. d. tymp. mem. retracted; in front a slight perforation. a. s. plenty of evil-smelling pus; total defect of tymp. mem. The labyrinth wall is granulated.

Whisp. $\frac{> 8.00}{0.10}$. A.c. $\frac{35 \text{ sec.}}{7 \text{ sec.}}$. B.c. $\frac{18 \text{ sec.}}{10 \text{ sec.}}$. Rinne $\frac{+}{\div}$

Weber $\downarrow$. l.l. $\frac{45}{90}$ u. l. $\frac{22.000}{18.000}$ temp. meas. $\frac{+ 0\,°.4 \div 0\,°.4}{+ 0\,°.8 \div 0\,°.3}$

No. 70. (sect. 4001) m. 34 years. Otit. med. supp. chr. sin., fistula labyrinthi? After typhoid fever at the age of 14 had discharge from left ear. Never dizziness or cerebral cases. a. d. normal, a. s. big perforation in tymp. mem. at the rear; pus is scant. Labyrinth-wall granulated.

Whisp. $\frac{> 7.00}{3.00}$. A.c. $\frac{60}{18}$. B.c. $\frac{17}{22}$. Rinne $\frac{+}{\div}$

. Weber $\rightarrow$ l.l. $\frac{16}{50}$ u. l. $\frac{24.000}{15.000}$

No spont. nystagmus. By pressure in left auditory canal got no nystagmus; by aspiration nystagmus to right.

20 ° water $\frac{18 \text{ sec.}}{12 \text{ sec.}}$ rot. $\frac{35 \text{ sec.}}{42 \text{ sec.}}$ temp. meas. (fall 52 ctm.) $\frac{+ 0\,°.3 \div 0\,°.3}{+ 1\,°.0 + 0\,°.2}$

Temp. meas. (fall 27 ctm.) $\frac{}{+ 1\,°.2 + 0\,°.4}$

No. 71. (polyclinic 1192/21) m. 35 years. Otit. med. supp. chr. sin. 9 years old operated on left ear; outflow after that, stopping 2 years ago. Since then dizziness. a. d. natural. a. s. Background covered with a grayish membrane which is indolent and yields to pressure. It was split open, whereby a serous bloody fluid was emptied out. A week later acoustic and vestibular tests were performed.

Whisp. $\frac{> 8.00}{\text{a.a. (Ba)}}$. A. c. $\frac{45 \text{ sec.}}{12 \text{ sec.}}$. B. c. $\frac{13 \text{ sec.}}{13 \text{ sec.}}$. Rinne $\frac{+}{\div}$ Weber $\rightarrow$. l.l. $\frac{}{140}$

No spont. nystagmus, past-pointing, or falling tendency. No fistula symptoms.

20 ° water $\frac{75 \text{ sec. dur. } 124 \text{ sec.}}{\text{no nyst. (3 min.)}}$ rot. $\frac{\text{no nyst.}}{\text{few sec.}}$

Temp. meas. $\frac{+ 0\,°.6 \div 1\,°.8}{+ > 10\,°.0 \div > 32\,°.0}$

No. 72. (sect. 3554) m. 37 years. seq. operationis. radicalis sin. Has had outflow from left ear in 25—30 years. Was radically operated 18/2 21. Previous hereto powerful nystagmus on left ear by pressure in the ear-passage, while aspiration did not give nystagmus. Pressure on left side gave powerful nystagmus to right. At present (13/12 21, that is ten months later) no fistula symptom found, and the operation-cavity is almost completely epidermised.

20 ° water $\frac{7 \text{ sec. dur. } 115 \text{ sec.}}{7 \text{ sec. dur. } 95 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.3 \div 0\,°.3}{+ 0\,°.1 \div 0\,°.5}$

At the operation a fistula found on the lateral archway.

No. 73. (sect. 3594) f. 15 years. seq. operationis radicalis sin. Left ear flowing for 6 years. Was radically operated upon 2/7 20. Then no fistula symptoms or spont. nystagmus were found. She has had dizziness since, especially on flushing of ear, and there has always been abundant secretion from it. In nov. 1920 some granulations were removed from the cavity, and she has been more dizzy since. Besides she has suffered somewhat from headache.

At present (5/4 21) there is a radical-operation cavity with a quantity of stinking secretion.

Whisp. $\frac{> 8.00}{2.00}$ whisp. (Ba.) $\frac{-}{1,5}$ a. c. $\frac{55 \text{ sec.}}{15 \text{ sec.}}$ b. c. $\frac{25 \text{ sec.}}{25 \text{ sec.}}$

Rinne $\frac{+}{\div}$ Weber ↓. 1.1. $\frac{16}{24}$ u. 1. $\frac{0.8}{0.8}$

In optimum position a weak spont. nystagmus to left. Pressure in left ear passage gives no nystagmus; by aspiration light nystagmus to right.

20 ° water $\frac{14 \text{ sec. dur. } 135 \text{ sec.}}{5 \text{ sec. dur. } 95 \text{ sec.}}$ rot. $\frac{30 \text{ sec.}}{47 \text{ sec.}}$ temp. meas. $\frac{+ 1\,°.1 + 0\,°.6}{\div 0\,°.6 \div 0\,°.8}$

No 74. (sect. 3870) f. 17 years. Otit. med. supp. chr. dupl.

Has had outflow from both ears for 3 years. During the whole of her sickness she has once or twice a week had headache and dizziness with rotatory feelings on left with nausea without vomiting; a. d. and s.: nearly total defect of tymp. mem. with a quantity stinking pus. Labyrinth wall granulated.

Whisp. $\frac{0{,}25}{0{,}10}$ a. c. $\frac{13 \text{ sec.}}{7 \text{ sec.}}$ b. c. $\frac{7 \text{ sec.}}{7 \text{ sec.}}$. Rinne $\frac{?}{?}$

Weber ↑. 1.1. $\frac{90}{90}$ u. 1. $\frac{15.000}{18.000}$

20 ° water $\frac{14 \text{ sec. dur. } 119 \text{ sec.}}{13 \text{ sec. dur. } 125 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.3 \div 0\,°.3}{+ 0\,°.2 \div 0\,°.5}$

No. 75. (sect. 3723) m. 20 years. Otit. med. supp. chr. dx. seq. otit. med. supp. sin. Said to have been hard of hearing from quite young. After having had a box on the right ear more than half a year ago, this ear began to flow. The hearing is said to have been much impaired in the latter half year. He never got dizziness. A. d. tymp. mem. thickened; in front a central medium sized perforation, the labyrinth wall reflects. a. s. dry; upwards to rear a central perforation. Tymp. mem. however much thickened; the labyrinth wall pink.

Whisp. $\frac{0}{0}$ Speak. t. $\frac{0.10 \text{ (Ba).}}{0.10 \text{ (Ba).}}$. A. c. $\frac{14 \text{ sec.}}{15 \text{ sec.}}$. B. c. $\frac{13 \text{ sec.}}{10 \text{ sec.}}$. Rinne $\frac{?}{+}$

Weber →. 1.1. $\frac{55}{90}$ u. 1. $\frac{22.000}{18.000}$ No spont. nyst., no fistula symptom.

Temp. meas. $\frac{+ 0\,°.9 \div 0\,°.3}{+ 0\,°.2 \div 0\,°.2}$

No. 76. (sect. 3963) m. 51 years. Otit. med. supp. chr. sin. seq. otit. supp. dx. From 7 years old had outflow from both ears. Hearing become steadily impaired, until he after taken cold half a year ago became almost entirely deaf. He has much ringing in left ear, never dizziness or cerebral fits. a. d. tymp. mem. is retracted, cicatricial; slight perforation to rear; no secretion. a. s. auditory canal filled up with a big polypus.

Speak. t. $\frac{0}{0}$. Shout. $\frac{\text{a. a.}}{0}$. A. c. $\frac{0}{0}$. B. b. $\frac{11\text{ sec.}}{11\text{ sec}}$. Rinne $\frac{\div}{\div}$

Weber. $\downarrow$. l. l. $\frac{\text{e—2}}{\text{e—2}}$ u. l. $\frac{6000}{\text{h—3}}$ 20° water $\frac{17\text{ sec. dur. }102\text{ sec.}}{20\text{ sec. dur. }76\text{ sec.}}$

Rot. $\frac{20\text{ sec.}}{18\text{ sec.}}$ 5 ccm. 35° $\frac{12\text{ sec.}}{12\text{ sec.}}$

Temp. meas. $\frac{+\,0°.5 \div 0°.9}{+\,0°.8 \div 0°.7}$. No fistula symptoms.

No. 77. (sect. 3626) m. 16 years. Otit. med. supp. chr. dex.

Has outflow from right ear for six years. Never dizziness or cerebralia. a. d. stinking pus, big perforation in front. Rest of tymp. mem. is red and thickened. Behind tymp. mem. whitish masses. A. s. natural.

Whisp. $\frac{3.00}{> 8.00}$. A. c. $\frac{40\text{ sec.}}{60\text{ sec.}}$. B. c. $\frac{20\text{ sec.}}{25\text{ sec.}}$. Rinne $\frac{\div}{+}$ Weber $\rightarrow$ l. l. $\frac{60}{16}$

20° water $\frac{12\text{ sec. dur. }160\text{ sec.}}{15\text{ sec. dur. }130\text{ sec.}}$ rot. $\frac{23\text{ sec.}}{22\text{ sec.}}$ temp. meas. $\frac{+\,0°.7 \div 0°.3}{+\,0°.4 \div 0°.3}$

No 78. (sect. 3583) m. 35 years. seq. operationis radicalis sin.

As long he can remember he has had outflow from left ear, was radical-operated upon on left side here in March 21. The operation-cavity is now (17/1 22) epidermised.

Whisp. $\frac{\div}{0.25}$. No fistula symptoms.

20° water $\frac{10\text{ sec. dur. }108\text{ sec.}}{8\text{ sec. dur. }72\text{ sec.}}$ 5 ccm. 35° $\frac{19\text{ sec.}}{11\text{ sec.}}$ rot, $\frac{30\text{ sec.}}{35\text{ sec.}}$

Temp. meas. $\frac{+\,0°.3 \div 0°.3}{+\,0°.3 \div 0°.3}$. With adrenalin in left ear $\frac{}{+\,0°.2 \div 0°.3}$

No. 79. (sect. 3624) f. 66 years. seq. operationis radicalis dx.

Had radical-operation performed 7 months previously. During the last 14 days past had heaviness in the head and dizziness; this however is very undistinctly characterized. A. d. radical-operation cavity; some pus in the tympanic cavity. A. s. natural. No spont. nystagmus on looking straight ahead; on glancing sidewards nystagmus in same directions respectively.

No spont. falling tendency. Whisp. $\frac{\text{a.a. (Ba)}}{> 8.00}$. Speak. t. $\frac{0{,}50}{}$

A. c. $\frac{13 \text{ sec.}}{55 \text{ sec.}}$. B. c. $\frac{25 \text{ sec.}}{20 \text{ sec.}}$. Rinne $\frac{\div}{+}$. Weber ↑1.1. $\frac{120}{16}$

20° water $\frac{5 \text{ sec. dur. } 114 \text{ sec.}}{17 \text{ sec. dur. } 130 \text{ sec.}}$ rot, $\frac{35 \text{ sec.}}{40 \text{ sec.}}$ temp. meas. $\frac{+ 0°.1 \div 0°.7}{+ 1°.5 \div 0°.1}$

No. 80. (sect. 3759) m. 20 years. Otit. med. supp. chr. dx.

For 6 years at intervals had outflow from right ear, and has now pains; has always been very dizzy when placed in elevated places, and suffers much from nausea, can for instance not at all drive in a merry-go-round. A. d. limbic perforation in tymp. mem. with antrum fistula. A. s. tymp. mem. retracted.

Whisp. $\frac{1.00}{7.00}$. A.c. $\frac{22 \text{ sec.}}{25 \text{ sec.}}$. B. c. $\frac{12 \text{ sec.}}{12 \text{ sec.}}$. Rinne $\frac{+}{+}$

Weber ↓. 1.1. $\frac{18}{26}$ u. 1. $\frac{21.000}{21.000}$

20° water $\frac{10 \text{ sec. dur. } 187 \text{ sec.}}{11 \text{ sec. dur. } 158 \text{ sec.}}$ rot. $\frac{45 \text{ sec.}}{50 \text{ sec.}}$ temp. meas. $\frac{+ 0°.1 \div 0°.3}{+ 0°.1 \div 0°.3}$

No. 81. (sect. 3753) m. 14 years. Otit. med. supp. chr. dx.

Has for 7—8 years had purulent discharge from right ear, but never pains, headache or dizziness. A. d. plenty of pus; ear passage filled up with polypi. A. s. natural. No spont. nystagmus.

Whisp. $\frac{\text{a.a.}}{> 8.00}$. A.c. $\frac{16 \text{ sec.}}{28 \text{ sec.}}$. B. c. $\frac{8 \text{ sec.}}{14 \text{ sec}}$. Rinne $\frac{+}{+}$ 1.1. $\frac{50}{21}$ u. 1. $\frac{1{,}4}{1{,}1}$

20° water $\frac{20 \text{ sec. dur. } 103 \text{ sec.}}{17 \text{ sec. dur. } 122 \text{ sec.}}$ rot. $\frac{25 \text{ sec.}}{35 \text{ sec.}}$ temp. meas. $\frac{+ 0°.5 \div 0°.3}{+ 0°.1 \div 0°.3}$

No. 82. (sect. 3606) m. 28 years. seq. otit. supp. sin.

At the age of 5, had outflow from left ear during haft a year, and 1 year ago again had discharge from left ear for 14 days (9/4 21); suffers now from humming in both ears, which began during the war, when he was a stoker onboard a german torpedo boat. A. d. natural. A. s. tymp. mem. cicatricial, retracted, little dry perforation. No spont. nystagmus, past-pointing or falling tendency.

Whisp. $\frac{8{,}00}{1.5}$. A.c. $\frac{50 \text{ sec.}}{15 \text{ sec.}}$. B. c. $\frac{25 \text{ sec.}}{25 \text{ sec.}}$. Rinne $\frac{+}{\div}$

Weber ↓ 1.1. $\frac{16}{110}$ u. 1. $\frac{\text{nat.}}{\text{nat.}}$

20° water $\frac{18 \text{ sec. dur. } 130 \text{ sec. } 34 \text{ sec.}}{17 \text{ sec. dur. } 146 \text{ sec. } 31 \text{ sec.}}$ rot. temp. meas. $\frac{+ 0°.3 \div 0°.3}{+ 0°.1 \div 0°.5}$

No. 83. (Polycl. 3876/21) f. 18 years. seq. otit. supp. sin.

Had outflow from left ear for more than a year; now ear is dry; never giddy. A. d. natural. A. s. tymp. mem. cicatricial with big perforation at the rear. No spont. nystagmus.

Whisp. $\frac{> 8.00}{0.05}$. A.c. $\frac{32 \text{ sec.}}{12 \text{ sec.}}$. B.c. $\frac{12 \text{ sec.}}{17 \text{ sec.}}$. Rinne $\frac{+}{\div}$

Weber ↓ l.l. $\frac{18}{24}$ u. l. $\frac{25.000}{25.000}$ 20° water $\frac{10 \text{ sec. dur. } 132 \text{ sec.}}{5 \text{ sec. dur. } 170 \text{ sec.}}$

5 ccm. 35° $\frac{22 \text{ sec.}}{14 \text{ sec.}}$ temp. meas. $\frac{+ 0°.2 \div 0°.3}{+ 0°.2 \div 0°.3}$

No. 84. (sect. 3575) m. 19 years. seq. operationis radicalis sin. Discharge from left ear for 9 years, radically-operated on left side a month ago. Previous to operation dizziness occasionally without falling tendency. A. d. natural. A. s. radical-operation cavity, which is partly epidermised, partly granulating.

Whisp. $\frac{> 8.00}{0.50}$. A.c. $\frac{53 \text{ sec.}}{42 \text{ sec}}$. B.c. $\frac{16 \text{ sec.}}{18 \text{ sec.}}$. Rinne $\frac{+}{+}$. Weber ↓ l.l. $\frac{16}{90}$

20° water $\frac{11 \text{ sec. dur. } 128 \text{ sec.}}{7 \text{ sec. dur. } 142 \text{ sec.}}$ rot. $\frac{25 \text{ sec.}}{28 \text{ sec.}}$ temp. meas. $\frac{+ 0°.2 \div 0°.2}{+ 0°.8 \div 0°.3}$

No. 85. (sect. 3600) f. 24 years. Otit. med. supp. chr. sin. Since the age of 13 discharge from left ear; never dizziness; occasionally headache.

A. d. tymp. mem. cicatricial. A. s. stinking pus, perforation in tymp. mem. ant. No spont. nystagmus, nor fistula symptoms.

Whisp. $\frac{8{,}00}{2.00}$. A.c. $\frac{60 \text{ sec.}}{15 \text{ sec.}}$. B.c. $\frac{20 \text{ sec.}}{25 \text{ sec.}}$. Rinne. $\frac{+}{\div}$

Weber ↓ l.l. $\frac{16}{90}$. u.l. $\frac{0{,}5}{0{,}5}$

20° water $\frac{14 \text{ sec. dur. } 132 \text{ sec.}}{16 \text{ sec. dur. } 145 \text{ sec.}}$ rot, $\frac{25 \text{ sec.}}{27 \text{ sec.}}$ temp. meas. $\frac{+ 0°.5 \div 0°.2}{+ 0°.2 \div 0°.2}$

No. 85b. (sec. 3819) f. 18 years. seq. operat. rad. dx. Otit. med. supp. chr. sin. Has from 1 year of age occasionally had discharge from both ears, and during almost the same time had leftsided facial paresis. Never dizziness. About 3 weeks ago she was radically-operated on right ear. A. d. radical-operation cavity. A. s. about total defect of tymp. mem.

20° water $\frac{15 \text{ sec. dur. } 92 \text{ sec.}}{11 \text{ sec. dur. } 85 \text{ sec.}}$ temp. meas. $\frac{+ 0°.0 \div 1°.2}{+ 0°.3 \div 0°.4}$

after treating left tymp. cavity for 20 min. with 10% cocaine:

Temp. meas. $\frac{}{+ 0°.3 \div 0°.4}$

No. 86. (polycl. 3823) m. 28 years. Syphilis.

Infected with syphilis in 1915. Has not been treated since 1916. Formerly during treatment with mercury, and also later, he has felt like a crackling in left ear. The hearing is now and then impaired. There has never been outflow from the ears, nor dizziness. Both drum-membranes are natural.

Whisp. $\frac{> 8.00}{> 8.00}$. A. c. $\frac{27 \text{ sec.}}{19 \text{ sec.}}$. B. c. $\frac{12 \text{ sec.}}{10 \text{ sec.}}$. Rinne $\frac{+}{\cdot}$

Weber $\rightarrow$ l.l. $\frac{16}{16}$ u. l. $\frac{18.000}{18.000}$

20° water $\frac{16 \text{ sec. dur. } 152 \text{ sec.}}{24 \text{ sec. dur. } 124 \text{ sec.}}$ rot, $\frac{20 \text{ sec.}}{40 \text{ sec.}}$ temp. meas. $\frac{+ 0°.7 \div 0°.5}{+ 0°.1 \div 0°.1}$

No spont. nystagmus, past-pointing or falling tendency.

No. 87. (polycl. 969/22 sect. H. 233/22) m. 31 years. Syphilis.

Had in 1916 an ulcus penis, which was not treated. Got outbreak in 1921. Wass. then strongly positive. Had 40 inunctions and 4 salvarsan injections administred, and later 30 inunctions. Wass. now again positive. Has for 5 days got inunctions, and 4 days later salvarsan 0.40. Eye-test shows normal conditions. Cerebro-spinal fluid: no Wass, no cells, Glob. 0, Alb. 10. Has never had symptoms of ear disease or dizziness. Tymp. mem. normal.

Whisp. $\frac{> 13.00}{> 13.00}$. No spont. nystagmus, past-pointing, or falling tendency.

20° water $\frac{14 \text{ sec. dur. } 132 \text{ sec.}}{11 \text{ sec. dur. } 124 \text{ sec.}}$ rot, $\frac{38 \text{ sec.}}{36 \text{ sec.}}$

5 ccm. 35° $\frac{18 \text{ sec. } 10—12 \text{ beats}}{7 \text{ sec. regular nyst.}}$ temp. meas. $\frac{+ 0°.1 \div 0°.4}{+ 0°.2 \div 0°.3}$

No. 88 (polycl. 917/21 sect. H. 267/21) m. 48 years. Syphilis.

In 1908 a syphilitic affection in the knee was noted, and he got 60 inunctions. In 1909 again 30 inunctions were administred. In 1918 and 1920 he got potassium iodid. Has now (22/3 21) periostitis cruris dx., radii dx., cranii. Wass. in the blood is strongly positive. Cerebro-spinal fluid: No Wass., Cells 0, Glob < 1, Alb. < 10; never ear-cases, never dizziness. Tymp. mem. and hearing nat. No spont. nystagmus or falling tendency, but slight tendency to outward past-pointing in left arm; otherwise no past-pointing.

20° water $\frac{15 \text{ sec. dur. } 137 \text{ sec.}}{15 \text{ sec. dur. } 140 \text{ sec.}}$ rot, $\frac{34 \text{ sec.}}{35 \text{ sec.}}$ temp. meas. $\frac{+ 0°.3 \div 0°.3}{+ 0°.3 \div 0°.1}$

No. 89. (sect. 3887) m. 48 years. Syphilis.

Knows nothing about infection. Never dizziness or ear disease. Tymp. membranes natural.

Whisp. $\frac{> 13.00}{> 13.00}$. B. c. $\frac{5 \text{ sec.}}{7 \text{ sec.}}$ u. l. $\frac{1,8}{1,8}$

20° water $\frac{15 \text{ sec. dur. } 145 \text{ sec.}}{20 \text{ sec. dur. } 124 \text{ sec.}}$ rot. $\frac{39 \text{ sec.}}{55 \text{ sec.}}$ temp. meas. $\frac{+ 2°.5 \div 0°.3}{+ 0°.1 \div 2°.7}$

D. fl. 20° $\frac{560 \text{ ccm.}}{720 \text{ ccm.}}$ gives nystagmus to left after 3 min.

No. 90. (polycl. 2711/21 sect. H. 628/21) m. 39 years. Syphilis. Had 15 years ago gonorrhea; knows nothing about syphilis. Wass. in the blood is now strongly positive. Cerebro-spinal fluid: No Wass., Cells 0.3, Glob. 1, Alb. 10. Has got inunctions for 6 days. Never had ear disease or dizziness. Tymp. mem. and hearing natural. No spont. nystagmus, past-pointing or falling tendency.

20° water $\frac{\text{15 sec. dur. 140 sec.}}{\text{16 sec. dur. 142 sec.}}$ rot, $\frac{\text{31 sec.}}{\text{35 sec.}}$ temp. meas. $\frac{+ 1°.4 \div 0°.3}{+ 0°.4 \div 0°.4}$

No. 91. (polycl. 3415/21 sect. H. 713/21) m. 25 years. Syphilis. Infected about 2 months previously. Now macular papular syphilis. Wass. in the blood positive. Cerebro-spinal fluid: No Wass., Cells 1, Glob. 0, Alb. 40. No ear-cases or dizziness. Tymp. mem. and hearing natural. No spont. nystagmus, past-pointing or falling-tendency. Has got inunctions for 4 days; salvarsan 0.60, 4 days ago.

20° water $\frac{\text{13 sec. dur. 125 sec.}}{\text{12 sec. dur. 106 sec.}}$ rot, $\frac{\text{20 sec.}}{\text{20 sec.}}$ temp. meas. $\frac{+ 0°.5 \div 1°.7}{+ 0°.3 \div 1°.7}$

No. 92. (polycl. 322/22 sect. H. 94/22) f. 25 years. Syphilis. Does not know when infected. No outbreak. Has now gonorrhea, artrotis manus. Wass. is strongly positive. Never had ear disease or dizziness. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 0, Alb. < 10. Has got inunctions for 5 days, and salvarsan 4 days ago (0.40). Both drum-membranes are somewhat pale. No spont. nystagmus, past-pointing or falling tendency.

Whisp. $\frac{> 7}{> 7}$. A. c. $\frac{\text{45 sec.}}{\text{45 sec.}}$. B. c. $\frac{\text{15 sec.}}{\text{10 sec.}}$. Rinne. $\frac{+}{+}$

Weber → 1. 1. $\frac{16}{16}$ u. 1. $\frac{25.000}{25.000}$ 20° water $\frac{\text{20 sec. dur. 106 sec.}}{\text{22 sec. dur. 128 sec.}}$

5 ccm. 35° $\frac{\div}{\div}$ 10 ccm. 35° $\frac{\text{32 sec.}}{\text{29 sec.}}$ rot, $\frac{\text{14 sec.}}{\text{5 sec.}}$

Temp. meas. $\frac{+ 0°.5 \div 1°.7}{+ 0°.8 \div 1°.9}$

D. fl. 20° $\frac{\text{170 ccm.}}{\text{200 ccm}}$. Nystagmus to right after 1 min.

D. fl. 48° $\frac{\text{270 ccm.}}{\text{360 ccm.}}$. Nystagmus to left after 2 min.. 11 days later:

D. fl. 20° $\frac{\text{480 ccm.}}{\text{460 ccm.}}$ whereby no nystagmus occurs (after 3 min).

No. 93. (polycl. 1145/22 sect. H. 276/22) f. 19 years. Syphilis. Coitus last time 7 months ago. Gave birth 1 month ago to a mature living child. Has now macular papular syphilis. Wass. is strongly positive. Ophthalmoscopy is normal. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 0, Alb. < 10. Commenced inunction cure

a month ago, and has during the same time moreover got 3 times salvarsan 0.40. Drum-membrane and hearing natural.

20° water $\frac{\text{17 sec. dur. 143 sec.}}{\text{17 sec. dur. 139 sec.}}$ 5 ccm. 35° $\frac{\text{12 sec.}}{\text{12 sec.}}$ rot, $\frac{\text{35 sec.}}{\text{33 sec.}}$

Temp. meas. $\frac{+ 0°.3 \div 0°.8}{+ 0°.3 \div 0°.4}$

D. fl. 20° $\frac{\text{320 ccm.}}{\text{240 ccm.}}$ After 3½ min. doubtful nystagmus to right.

No. 94. (sect. 3927) f. 17 years. Saddle nose. Syphilis.

Has saddle nose from childhood, Wass. is negative. Both drum-membranes are slightly retracted and cicatricial. Hearing natural. No spont. nystagmus.

20° water $\frac{\text{14 sec. dur. 135 sec.}}{\text{13 sec. dur. 129 sec}}$ 5 ccm. 35° $\frac{\text{13 sec.}}{\text{10 sec.}}$ rot, $\frac{\text{22 sec.}}{< \text{10 sec.}}$

Temp. meas. $\frac{+ 0°.5 \div 0°.3}{+ 0°.2 \div 1°.1}$

No. 95. (polycl. 1151/21 sect. H. 281/21) m. 22 years. Syphilis.

Infected about 2 months ago. Wass. now strongly positive. Cerebro-spinal fluid: No Wass., Cells 15 pr. cmm., Glob. < 1, Alb. > 10 < 20. Ophthalmoscopy natural. Has got inunction for 9 days, and salvarsan 0.50 twice. Never had ear disease, nor dizziness. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing, or falling-tendency.

20° water $\frac{\text{17 sec. dur. 122 sec.}}{\text{15 sec. dur. 121 sec.}}$ rot, $\frac{\text{30 sec.}}{\text{37 sec.}}$ temp. meas. $\frac{+ 0°.1 \div 0°.3}{+ 0°.2 \div 0°.5}$

No. 96. (polycl. 242/22 sect. H. 96/22) f. 19 years. Syphilis.

In her childhood she had outflow from both ears. She is disposed to dizziness, and is more tired and dizzy since half a year ago observed sores on the genitals. Wass. now strongly positive; ophthalmoscopy natural. Cerebro-spinal lymph: No Wass., Cells 0, Glob. 0, Alb. < 10. Both tymp. mem. are the seat of a calcium infiltration, but otherwise natural.

Whisp. $\frac{> 7.00}{> 7.00}$. A.c. $\frac{\text{30 sec.}}{\text{18 sec.}}$. B.c. $\frac{\text{8 sec.}}{\text{13 sec.}}$. Rinne $\frac{+}{+}$

Weber → l.l. $\frac{24}{24}$ u. l. $\frac{18.000}{19.000}$

No spont. nystagmus, past-pointing, or falling tendency

20° water $\frac{\text{15 sec. dur. 118 sec.}}{\text{15 sec. dur. 122 sec.}}$ rot, $\frac{\text{30 sec.}}{\text{28 sec.}}$

5 ccm. 35° $\frac{\text{48 sec.}}{\text{23 sec.}}$ temp. meas. $\frac{+ 0°.2 \div 0°.4}{+ 0°.9 \div 0°.2}$

No. 97. (polycl. 1610/21 sect. H. 378/21) m. 28 years. Syphilis. Had 8 years ago an ulcus penis, which was diagnosed as a soft chancre; he knows otherwise nothing about venereal diseases. Has at present got a severe outbreak. Wass. is strongly positive. Cerebro-spinal lymph: Wass. negative, Cells 3, Glob. < 1, Alb. < 10. Ophthalmoscopy normal. Has got inunction for 13 days, and salvarsan (0.50) 7 days ago. Never ear disease; drum-membranes and hearing natural. No spont. nystagmus; past-pointing or falling tendency.

20° water $\frac{17 \text{ sec. dur. } 117 \text{ sec.}}{17 \text{ sec. dur. } 111 \text{ sec.}}$ rot. $\frac{37 \text{ sec.}}{27 \text{ sec.}}$ temp. meas. $\frac{+ 0°.1 \div 0°.3}{+ 0°.1 \div 0°.3}$

No. 98. (polycl. 3923) m. 68 years. Syphilis. Got syphilis 35 years ago. Now extremely hard of hearing. Spont. nystagmus to left.

Whisp. $\frac{0}{0}$ Shout $\frac{0}{—}$, loud sp. $\frac{\quad}{0.50}$. A.c. $\frac{0}{9 \text{ sec.}}$. B.c. $\frac{0}{4 \text{ sec.}}$. Rinne $\frac{0}{+}$

Weber ↓ l.l. $\frac{\quad}{24}$ u. l. $\frac{\quad}{14.000}$

20° water $\frac{\text{no reaction (3 min.).}}{35 \text{ sec. dur. } 91 \text{ sec}}$ rot, $\frac{17 \text{ sec.}}{17 \text{ sec.}}$ 5 ccm. 35° $\frac{\text{no reaction}}{\text{no reaction}}$

5 ccm. 27° $\frac{\text{no reaction}}{30 \text{ sec.}}$ temp. meas. $\frac{+ \text{ ca. } 10°.0}{\div 2°.0 \div 2°.4}$

No. 99. (polycl. 906/22 sect. H. 230/22) f. 21 years. Syphilis. Gave birth 17 days before to a macerated child. Wass. strongly positive. Never had ear diseases. There is a strabismus divergens concomitans sin. with squinting-angle 20°. Cerebro-spinal fluid: No Wass., Cells 0, Glob 0, Alb. < 10. Has got inunctions for 2 days, since then salvarsan 0.40. Tymp. mem. normal.

Whisp. $\frac{> 8.00}{> 8.00}$. B. c. $\frac{14 \text{ sec.}}{11 \text{ sec.}}$. Weber → l.l. $\frac{22}{22}$ u. l. $\frac{1{,}4}{1{,}4}$

There is spont. nystagmus to right; slight past-pointing outward in both shoulders, otherwise no past-pointing; no falling tendency.

20° water $\frac{110 \text{ sec. before ny. turns. dur. } 89 \text{ sec.}}{}$ rot, $\frac{\text{ca. } 30 \text{ sec.}}{\text{ca. } 30 \text{ sec.}}$

Temp. meas. $\frac{\div 0°.5 \div 1°.3}{+ 7°.5 + 6°.7}$

D. fl. 20° $\frac{900 \text{ ccm.}}{620 \text{ ccm.}}$ after 5½ min. spont. nystagmus unchanged.

D. fl. 47° $\frac{750 \text{ ccm.}}{540 \text{ ccm.}}$ after 3 min. nystagmus vertical downwards.

No. 100. (polycl. 227/22 sect. H. 64/22) f. 26 years. Syphilis. Knows nothing about infection. Wass. was positive a month ago. Is suffering from chlorosis, and gets vertigo during her menstruation, otherwise not. Wass. is now negative. Ophthalmoscopy

is natural. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 0, Alb. < 10. Drum-membranes and hearing normal. No spont. nystagmus; past-pointing, or falling tendency.

20° water $\frac{10 \text{ sec. dur. } 150 \text{ sec.}}{16 \text{ sec. dur. } 219 \text{ sec}}$ 5 ccm. 35° $\frac{14 \text{ sec.}}{22 \text{ sec.}}$ rot. $\frac{48 \text{ sec.}}{39 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.3 \div 0°.2}{+ 0°.2 \div 0°.8}$ D. fl. 20°, after 3 min. no. nystagmus.

No. 101. (polycl. 799/22 sect. H. 232/22) m. 52 years. Syphilis. Coitus last time about 3 months ago. Now great outbreak. Wass. strongly positive. Ophthalmoscopy is natural. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 1, Alb. 10. Has got inunction for 15 days, and salvarsan 0.50 twice. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{27 \text{ sec. dur. } 80 \text{ sec.}}{26 \text{ sec. dur. } 100 \text{ sec.}}$ (ear passages are very narrow).

Rot. $\frac{30 \text{ sec.}}{34 \text{ sec.}}$ 5 ccm. 35° $\frac{20 \text{ sec. few beats. } 35 \text{ sec. short series ny.}}{26 \text{ sec. regular.}}$

By flushing of right side 1 min. after the first the very same figures are obtained.

Temp. meas. $\frac{+ 0°.5 \div 0°.3}{+ 0°.5 \div 0°.3}$

No. 102. (polycl. 278/22 sect. H. 106/22) f. 16 years. Syphilis. Infected 3 months ago. Wass. strongly positive. Cerebro-spinal lymph: No Wass., Cells 0, Glob. 0, Alb. 10, got salvarsan 0.10 and 0.40 respectively 3 days and 1 day ago; besides sublimate mixture and potassium iodide. She never had ear disease. Tymp. mem. natural. No spont. nystagmus, past-pointing or falling-tendency.

Whisp. $\frac{> 7.00}{> 7.00}$. A. c. $\frac{45 \text{ sec.}}{35 \text{ sec.}}$. B.'c. $\frac{7 \text{ sec.}}{12 \text{ sec.}}$. Rinne $\frac{+}{+}$

Weber ↓ l.l. $\frac{16}{16}$ u. l. $\frac{20.000}{20.000}$ 20° water $\frac{9 \text{ sec. dur. } 123 \text{ sec.}}{16 \text{ sec. dur. } 100 \text{ sec.}}$ rot. $\frac{20 \text{ sec.}}{22 \text{ sec.}}$

5 ccm. 35° $\frac{29 \text{ sec.}}{\div}$ 10 ccm. 35° $\frac{\quad}{42 \text{ sec.}}$ temp. meas. $\frac{+ 0°.2 \div 0°.3}{+ 0°.3 \div 1°.5}$

D. fl. 20° $\frac{70 \text{ ccm.}}{85 \text{ ccm.}}$ nyst. to left after 40 sec.

5 days later D. fl. 20° $\frac{50 \text{ ccm.}}{80 \text{ ccm.}}$. Nystagmus to left after 30 sec.

D. fl. 48° $\frac{420 \text{ ccm.}}{520 \text{ ccm.}}$. No nystagmus (3 min.).

No. 103. (polycl. 2579/21 sect. H. 651/21) f. 23 years. Syphilis. The affection has lasted about a month; she never had ear disease, but slight dizziness about a week previously. Has not

got any treatment. Wass. strongly positive, and ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells 10, Glob. 0, Alb. < 10, tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{\text{15 sec. dur. 164 sec.}}{\text{16 sec. dur. 150 sec.}}$ rot. $\frac{\text{25 sec.}}{\text{15 sec.}}$ temp. meas. $\frac{+ 0°.0 \div 0°.5}{+ 0°.1 \div 0°.4}$

No. 104. (polycl. 1436/21 sect. H. 320/21) m. 22 years. Syphilis. Got about 5 weeks ago a blister on peenis. Wass. is negative. Ophthalmoscopy natural. Cerebro-spinal lymph: No Wass., Cells 0, Glob. < 1, Alb. > 10 < 20. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{\text{19 sec. dur. 142 sec.}}{\text{24 sec. dur. 124 sec.}}$ rot. $\frac{\text{32 sec.}}{\text{37 sec.}}$ temp. meas. $\frac{+ 0°.4 \div 0°.6}{+ 0°.2 \div 1°.5}$

D. fl. 20° $\frac{\text{800 ccm.}}{\text{900 ccm.}}$. After 3 min. nystagmus to left.

D. fl. 46° $\frac{\text{810 ccm.}}{\text{900 ccm.}}$. No sure nystagmus (3 min.).

No. 105. (polycl. 2457/21 sect. H. 540/21) m. 20 years. Syphilis. Likely infected 2 months ago. Got eruption 3 days ago. Wass. strongly positive. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells 0.6, Glob. 0, Alb. < 10. Never had ear disease or dizziness. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling tendency.

20° water $\frac{\text{17 sec. dur. 176 sec.}}{\text{15 sec. dur. 112 sec.}}$ rot. $\frac{\text{24 sec.}}{\text{27 sec.}}$ temp. meas. $\frac{+ 0°.1 \div 0°.2}{+ 0°.2 \div 1°.2}$

No. 106. (polycl. 1307/22) m. 68 years. Syphilis.
Syphilis from 1870; got then inunction every day in 4 months, but no treatment later. Had ten days ago an attack of dizziness lasting 15 min. There were imaginary motions of the surroundings, but no ear-tingling or unconsciousness. Later he has had more similar attacks. Since quite young he has every month had severe fits of headache lasting a day. Now Wass. negative. Cerebro-spinal lymph: No Wass., Cells 0, Glob. 1, Alb. 20. Tymp. mem. natural. No spont. nystagmus, past-pointing or falling-tendency.

Whisp. $\frac{0.75}{1.00}$. A. c. $\frac{\text{32 sec.}}{\text{35 sec.}}$. B. c. $\frac{\text{8 sec.}}{\text{13 sec.}}$. Rinne $\frac{+}{+}$ 1.1. $\frac{\text{ca. 20}}{\text{ca. 30}}$ u. 1. $\frac{7.5}{6.5}$

20° water $\frac{\text{15 sec. dur. 171 sec.}}{\text{12 sec. dur. 238 sec}}$ rot. $\frac{\text{31 sec.}}{\text{32 sec.}}$ temp. meas. $\frac{+ 0°.4 \div 0°.5}{+ 1°.0 \div 0°.3}$

some days later removed to Kom. Hosp. Sect. VI. for mb. ment.

No. 107. (polycl. 1122/22 sect. H. 272/22) f. 18 years. Syphilis.
Last coitus two months previously; got 14 days ago sores on the genitals, and has now general outbreak. Wass. positive. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells 0,

Glob. 0, Alb. < 10. Has got inunctions for 7 days, and salvarsan 0.40. Never dizziness. Tymp. mem. and hearing normal. No spont. nystagmus, past=pointing, or falling=tendency.

20° water $\frac{18 \text{ sec. dur. } 130 \text{ sec.}}{12 \text{ sec. dur. } 142 \text{ sec.}}$ rot. $\frac{35 \text{ sec.}}{32 \text{ sec.}}$ 5 ccm. 35° $\frac{28 \text{ sec.}}{15 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.4 \div 0°.4}{+ 0°.4 \div 0°.4}$

No. 108. (polycl. 2162/20 sect. H. 568/21) m. 28 years. Syphilis. Admitted to sect. H. first time in 1919 for meningitis baseos cranii, meningomyelitis syphilitica; and several times later, getting inunctions and salvarsan. Vestibular test was performed 5 months previously, and conditions were then found normal. Tymp. mem. and hearing natural, no spont. nystagmus, past=pointing, or falling=tendency.

20° water $\frac{18 \text{ sec. dur. } 145 \text{ sec.}}{16 \text{ sec. dur. } 150 \text{ sec.}}$ rot. $\frac{30 \text{ sec.}}{35 \text{ sec.}}$ temp. meas. $\frac{+ 0°.3 \div 0°.3}{+ 0°.3 \div 0°.3}$

No. 109. (polycl. 280/22 sect. H. 117/22) m. 24 years. Syphilis cong?

Presumed to have syphilis cong. Is now at sect. H. for gummata linguae. Wass. is slightly positive. Ophthalmoscopy natural. Cere bro=spinal fluid: No Wass., Cells 7, Glob. 1, Alb. < 10. Has never had dizziness or ear disease. A. d. nat. A. s. Tymp. mem. cica=tricial.

Whisp. $\frac{>}{>}\frac{13.00}{13.00}$. A.c. $\frac{42 \text{ sec.}}{45 \text{ sec.}}$. B.c. $\frac{19 \text{ sec.}}{20 \text{ sec.}}$. Rinne $\frac{+}{+}$ u.l. $\frac{25.000}{25.000}$

There are no fistula symptoms. By straight glance from behind Bartels glasses spont., nearly exclusively rotatory nystagmus was got, most often directed to left; the difference between the slow and the quick phase is not, however, always very distinct. By side=glances powerful horizontal=rotatory nystagmus to the same sides respectively. No spontaneous past=pointing or falling=tendency (can stand on one foot).

20° water $\frac{8 \text{ sec. dur. } 115 \text{ sec.}}{13 \text{ sec. dur. } 105 \text{ sec.}}$ rot. $\frac{29 \text{ sec.}}{50 \text{ sec.}}$ 5 ccm. 35° $\frac{15 \text{ sec.}}{18 \text{ sec.}}$

Temp. meas. $\frac{+ 1°.5 \div 0°.3}{+ 0°.7 \div 0°.5}$

The reactions are difficult to read on account of spont. ny=stagmus.

No. 110. (polycl. 3384/21 sect. H. 723/21) f. 18 years. Syphilis. Got infected about 2 months ago. Had headache, falling out of hair and so on 1 month before. Has now got great outbreak. Wass. strongly positive. Cerebro=spinal fluid: No Wass. Cells 3, Glob. 0, Alb. 10. Never ear disease. Tymp. mem. and hearing normal. No spont. nystagmus, past=pointing or falling=tendency.

20° water $\frac{\text{12 sec. dur. 130 sec.}}{\text{12 sec. dur. 115 sec.}}$ rot. $\frac{\text{35 sec.}}{\text{35 sec.}}$ temp. meas. $\frac{+0°.3 \div 0°.2}{+0°.2 \div 0°.4}$

No. 111. (polycl. 1085/22 sect. H. 274/22) f. 23 years. Syphilis. Gave birth to a macerated syphilitic child 14 days ago, knows nothing about infection. Has now papulous eruption. Wass. strongly positive. Ophthalmoscopy normal. Cerebro-spinal fluid: No Wass. Cells 0, Glob. 0, Alb < 10. Suffered somewhat from dizziness at the end of the pregnancy. Never had ear disease. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing, or falling-tendency.

20° water $\frac{\text{14 sec. dur. 125 sec.}}{\text{13 sec. dur. 134 sec.}}$ rot. $\frac{\text{37 sec.}}{\text{31 sec.}}$ 5 ccm. 35° $\frac{\text{11 sec.}}{\text{15 sec.}}$ temp. meas. $\frac{+0°.6 \div 0°.4}{+0°.3 \div 0°.5}$

No. 112. (polycl. 574/22 sect. H. 180/22) f. 24 years. Syphilis. Is presumably infected about half a year previously, and has now macular papular syphilis. Wass. positive. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells ?, Glob. 0, Alb. 10. Tymp. mem. and hearing normal. In optimum-position spont. nystagmus to left. No past-pointing or falling-tendency, however some tottering during the test.

20° water $\frac{\text{12 sec. dur. 136 sec.}}{\text{21 sec. dur. 93 sec.}}$ rot. $\frac{\text{20 sec.}}{\text{35 sec.}}$ temp. meas. $\frac{+1°.3 \div 0°.3}{\div 0°.6 \div 1°.4}$

No. 113. (polycl. 1054/22 sect. H. 269/22) m. 42 years. Syphilis. Had syphilis 21 years ago, and got then 40 inunctions, has not been treated since. Wass. now weak positive. Ophthalmoscopy natural. Cerebro-spinal lymph: No Wass., Cells O, Glob. 2, Alb. 10. Never had ear disease, nor dizziness. Both tymp. mem. a little reddish. No spont. nystagmus, past-pointing, or falling-tendency. Hearing normal.

20° water $\frac{\text{12 sec. dur. 137 sec.}}{\text{16 sec. dur. 122 sec.}}$ rot. $\frac{\text{26 sec.}}{\text{35 sec.}}$ temp. meas. $\frac{+0°.8 \div 1°.4}{+1°.0 \div 0°.7}$

5 ccm. 35° $\frac{\text{12 sec. single beat.}}{\text{10 sec. single beat.}}$

1 min. later again 5 ccm. 35° $\frac{\text{13 sec. several beats.}}{\text{11 sec. several beats.}}$

D. fl. $\frac{\text{650 ccm.}}{\text{690 ccm.}}$. No nystagmus ($4^1/_2$ min.).

No. 114. (polycl. 3736/21 sect. H. 51/22) m. 30 years. Syphilis. Had 6 months ago a soft chancre, last 6 weeks exanthemata, sinking troubles, and impaired hearing. Great papulous outbreak. Wass. strong positive. Ophthalmoscopy: chorio-retinitis luetica. Cerebro-spinal fluid: Wass. weak positive, Cells 83, Glob. 4, Alb. 40. Both

tymp. mem. retracted. In optimum position by straight glance from behind Bartels glasses slight nystagmus to left. No spont. past-pointing or falling-tendency.

Whisp. $\frac{0.40}{0.20}$. A.c. $\frac{23\text{ sec.}}{17\text{ sec.}}$. B. c. $\frac{17\text{ sec.}}{12\text{ sec}}$. Rinne $\frac{+}{+}$

Weber $\rightarrow$ l.l. $\frac{18}{22}$ u. l. $\frac{23.000}{23.000}$

20 ° water $\frac{14\text{ sec. dur. }136\text{ sec.}}{18\text{ sec. dur. }115\text{ sec.}}$ rot. $\frac{20\text{ sec.}}{40\text{ sec.}}$ temp. meas. $\frac{+3°.1+1°.1}{+0°.5\div 0°.7}$

It appears that the spont. nystagmus practically vanishes when the apparatus is applied to the left ear by the temp. meas. test. One month later the following is found, still with spont. nystagmus to left:

20 ° water $\frac{13\text{ sec. dur. }103\text{ sec.}}{10\text{ sec. dur. }122\text{ sec.}}$ 5 ccm. 35 ° $\frac{\div}{\div}$ 5 ccm. 27 ° $\frac{17\text{ sec.}}{17\text{ sec.}}$

Temp. meas. $\frac{+2°.2+0°.6}{\div 0°.4\div 1°.4}$ Whisp. $\frac{5.00}{5.00}$

By that time he has got salvarsan 0.50 five times, besides daily inunction.

No. 115. (sect. 3839) f. 61 years. Syphilis, sarcoma rhino-pharyngis.

Has had syphilis many years ago. Wass. is now negative. She has been hard of hearing for many years, mostly on left ear, but never had ringing in the ears or dizziness. Both tymp. membranes are slightly retracted.

Whisp. $\frac{>13.00}{0.30}$. A.c. $\frac{41\text{ sec.}}{20\text{ sec.}}$. B. c. $\frac{10\text{ sec.}}{11\text{ sec.}}$. Rinne $\frac{+}{+}$.

Weber $\downarrow$ l.l. $\frac{18}{34}$ u. l. $\frac{2.1}{2.7}$

20 ° water $\frac{14\text{ sec. dur. }152\text{ sec.}}{18\text{ sec. dur. }119\text{ sec.}}$ temp. meas. $\frac{+0°.0\div 0°.7}{+0°.0\div 1°.3}$

No. 116. (polycl. 3574/20 sect. H. 3/21) m. 25 years. Syphilis.

Got for less than a month ago an ulcus penis. Wass. negative. In an inguinal gland spirochaeta pallida was found. Cerebro-spinal lymph: no Wass., Cells 0, Glob. <1, Alb. 10. Ophthalmoscopy shows on both sides slightly veiled papillae-edges, especially on the nasal side with broad full veins. The view-field is natural. No scotoma. He has got inunctions for 12 days, and salvarsan 0.50 twice. Wass. slightly positive 5 days ago. Has never got ear disease. Tymp. mem. natural. No spont. nystagmus, past-pointing or falling tendency.

Whisp. $\frac{>13.00}{>13.00}$. A. c. $\frac{42\text{ sec.}}{25\text{ sec.}}$. B. c. $\frac{17\text{ sec.}}{14\text{ sec.}}$. Rinne $\frac{+}{+}$

20 ° water $\frac{20\text{ sec. dur. }165\text{ sec.}}{30\text{ sec. dur. }120\text{ sec.}}$ rot $\frac{22\text{ sec.}}{30\text{ sec.}}$ temp. meas. $\frac{+0°.3\div 0°.5}{+0°.3\div 0°.5}$

No 117. (polycl. 1359/22 sect. H. 270/22) m. 55 years. Syphilis. Had gonorrhea 30 years ago. Contracted 6—7 weeks ago an inflammatory fimosis, for which he was given 100 mercury pills. Three weeks ago he felt pains in the eyes and got 4 inunctions. Has now a stomatitis mercurialis. Wass. is positive. Testing of the eyes shows cyclitis serosa o. d., iridocyclitis serosa o. s. Cerebro-spinal lymph: no Wass., Cells 150, Glob. 4, Alb. 20. Never ear cases or dizziness. Tymp. mem. and hearing natural. No spont. nystagmus, past-pointing or falling tendency.

20° water $\frac{\text{10 sec. dur. 218 sec.}}{\text{12 sec. dur. 149 sec.}}$ rot. $\frac{\text{37 sec.}}{\text{33 sec.}}$ 5 ccm. 35° $\frac{\text{10 sec.}}{\text{15 sec.}}$

Temp. meas. $\frac{+\,0°.4 \div 0°.2}{+\,0°.2 \div 0°.8}$

No. 118. (polycl. 137/22 sect. H. 93/22) f. 24 years. Syphilis. Contracted 5 months ago a sore on labium majus, after which is now seen an infiltrated cicatrice. Has for about a month got potassium iodid and sublimate. Wass. which formerly has been strongly positive, is now only slightly positive. Cerebro-spinal fluid: No Wass. 0, Cells O, Glob. 1, Alb. 10. Never ear diseases. Tymp. mem. and hearing natural.

20° water $\frac{\text{16 sec. dur. 156 sec.}}{\text{12 sec. dur. 147 sec.}}$ rot. $\frac{\text{27 sec.}}{\text{22 sec.}}$ 5 ccm. 35° $\frac{\div}{\text{29 sec.}}$

10 ccm. 35° $\frac{\text{23 sec.}}{\quad}$ temp. meas. $\frac{+\,0°.3 \div 0°.5}{+\,0°.3 \div 0°.4}$

No. 119. (polycl. 323/22 sect. H. 105/22) f. 21 years. Syphilis. Knows nothing about infection. Has given birth to a syphilitic child 3 weeks ago. She has now great outbreak, and strongly positive Wass. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass. Cells 0, Glob. O, Alb. 10. She has had inunctions for 4 days, and salvarsan 0.10. Never ear cases. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling tendency.

20° water $\frac{\text{11 sec. dur. 121 sec.}}{\text{13 sec. dur. 123 sec.}}$ rot. $\frac{\text{41 sec.}}{\text{47 sec.}}$ 5 ccm. 35° $\frac{\text{22 sec.}}{\text{27 sec.}}$

Temp. meas. $\frac{+\,0°.4 \div 0°.4}{+\,0°.2 \div 1°.0}$

D. fl. 20° $\frac{\text{140 ccm.}}{\text{160 ccm.}}$ nystagmus to left after 45 sec.

D. fl. 48° $\frac{\text{150 ccm.}}{\text{160 ccm.}}$ nystagmus to left after 50 sec.

No. 120. (polycl. 1996/21) f. 38 years. Syphilis. The husband is dead of aneurisma aortae (Wass. positive). She has seven healthy children; one died of bronchitis 11 months old. Has never had an abortion. She came to the polyclinic 2/7 21, and had then for about a month ringing and humming in left ear, and

complained of dizziness with vomitings. Drum-membranes are normal.

Whisp. $\frac{1.00}{> 8.00}$. A.c. $\frac{18\text{ sec.}}{11\text{ sec.}}$. B. c. $\frac{7\text{ sec.}}{0}$. Rinne

Weber ↑ l.l. $\frac{16}{24}$ u. l. $\frac{1,2}{1,8}$

Wass. is negative. She got syrup giberti fort, and the 16/7 21 shows whisp. 4.00 . She returns to the clinique the 17/1 22, without having taken medicin the last 3 months past. During the last week she has had several attacks of dizziness daily, lasting up to one hour, and accompanied with vomiting at the same time the humming in left ear is increased. There is no spont. nystagmus.

Whisp. $\frac{> 8.00}{0.10\text{ (Ba)}}$. A.c. $\frac{12\text{ sec.}}{4\text{ sec.}}$. B. c. $\frac{10\text{ sec.}}{7\text{ sec.}}$. Rinne $\frac{+}{\div}$ l.l. $\frac{16}{38}$ u.l. $\frac{25.000}{22.000}$

20 ° water $\frac{12\text{ sec. dur. }132\text{ sec.}}{17\text{ sec. dur. }102\text{ sec.}}$ 5 ccm. 35 ° $\frac{25\text{ sec.}}{\div}$

10 ccm. 35 ° $\frac{—}{22\text{ sec.}}$ temp. meas. $\frac{+ 0\,°.4 \div 1\,°.0}{+ 0\,°.4 \div 1\,°.6}$

No. 121. (polycl. 725/22) f. 40 years. Syphilis.

Has 12 years ago given birth to a syphilitic child, and is now with child again. Wass. positive. Has until three weeks ago got treatment in Rudolf Bergh's hospital. She has been very hard of hearing for about 20 years, and remembers having had outflow from left ear, but not when. A. d. natural. a. s. scant moisture, big perforation of tymp. mem.

Whisp. $\frac{0,10}{0}$. Shout $\frac{}{0\text{ (Ba)}}$. A.c. $\frac{10\text{ m.}}{}$. B. c. $\frac{0}{0}$

Further hearing-test futile on account of her dull comprehension. No fistula symptom.

20 ° water $\frac{13\text{ sec. dur. }143\text{ sec.}}{14\text{ sec. dur. }143\text{ sec.}}$ rot. $\frac{29\text{ sec.}}{26\text{ sec.}}$ temp. meas. $\frac{+ 0\,°.4 \div 0\,°.4}{+ 0\,°.5 \div 0\,°.6}$

On left ear the + limit is found at once without previous fl. with other temp.

No. 122. (polycl. 313/22 sect. H. 73/22) m. 21 years. Syphilis.

Had syphilis one year ago, and got altogether 109 inunctions and neosalvarsan 8.70. Wass. was then constantly negative. Has now an ulcus penis, wherein spirochaeta pallida found. Wass. neg. Last week had temple-headache; always been inclined to dizziness when bending forwards and backwards, also before infection. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells 0, Glob 0, Alb. 10. Tymp. mem. normal. No spont. nystagmus or past-pointing. By the falling-test he totters to right side independently of head-position.

Whisp. $\frac{> 8.00}{> 8.00}$. A.c. $\frac{23\text{ sec.}}{23\text{ sec.}}$. B. c. $\frac{10\text{ sec.}}{10\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber ↓ l.l. $\frac{16}{16}$ u. l. $\frac{24.000}{24.000}$ 20 ° water $\frac{15 \text{ sec. dur. } 150 \text{ sec.}}{16 \text{ sec. dur. } 155 \text{ sec.}}$ rot. $\frac{45 \text{ sec.}}{38 \text{ sec.}}$

5 ccm. 35 ° $\frac{22 \text{ sec.}}{15 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.5 \div 1\,°.8}{+ 0\,°.5 \div 1\,°.2}$

No. 123. (polycl. 365/22) m. 42 years. Syphilis.

Had syphilis from 1902; was treated last time in 1919. a d. Tymp. mem. much retracted. a. s. natural.

Whisp. $\frac{0{,}45}{0}$. Shout $\frac{-}{0}$. A.c. $\frac{11 \text{ sec.}}{0}$. B. c. $\frac{8 \text{ sec.}}{8 \text{ sec.}}$. Rinne $\frac{+}{\div}$

L.l. $\frac{16}{a}$ u. l. $\frac{16.000}{9.000}$ 20 ° water $\frac{20 \text{ sec. dur. } 143 \text{ sec.}}{22 \text{ sec. dur. } 151 \text{ sec.}}$ rot. $\frac{30 \text{ sec.}}{38 \text{ sec.}}$

5 ccm. 35 ° $\frac{35 \text{ sec.}}{32 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.3 \div 1\,°.1}{+ 0\,°.5 \div 0\,°.9}$

Observation of nystagmus rendered difficult by his constantly blinking the eyes.

No. 124. (polycl. 1488/21 sect. H. 345/21) f. 48 years. Syphilis.

Has a presumably 30 years old syphilis, now elephantiasis cruris. Wass. strongly positive. Ophthalmoscopy natural. Lumbar puncture fails. Has had calomel intramuscular 0.50 twelve and five days ago. Never had ear cases, not dizziness. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling-tendency.

20 ° water $\frac{21 \text{ sec. dur. } 152 \text{ sec.}}{22 \text{ sec. dur. } 140 \text{ sec.}}$ rot. $\frac{50 \text{ sec.}}{52 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.2 \div 0\,°.4}{+ 0\,°.2 \div 0\,°.5}$

No. 125. (polycl. 1169/22 sect. H.) m. 22 years. Syphilis.

Was sent to Næstved garrison hospital on 6/6 1921 for syphilis, and got there neosalvarsan 0.30 + 0.45 and 36 inunctions; was dismissed 26/7 21. About the 21/8 21 hard-hearing on left ear developed in the course of three days together with some dizziness, which gradually decreased. From 28/10 to 23/12 he was at Roskilde garrison hospital given 50 inunctions, 2 bottles medicin, and some mercury pills. Before the dizziness had disappeared he got a fresh attack more severe than the former, and simultaneously a complete deafness on right ear developed within 5 min. (18/1 1922); the dizziness is again somewhat decreased. Now (20/4 1922) Wass. is strongly positive, The ophthalmoscopy is natural. Cerebro-spinal lymph: Wass. strongly positive, Cells 49, Glob. 4, Alb. 40. Tymp. mem. normal. He is totally deaf on both ears. There is spont. nystagmus to left, no spont. past-pointing, nor spont. falling-tendency, although he totters a little during the testing.

20 ° water $\frac{\text{after 3 min. spont. nyst. unchanged}}{40 \text{ sec. (before nyst. turns) dur. } 100 \text{ sec.}}$ rot. $\frac{5 \text{ sec. (2 beats)}}{5 \text{ sec. (2 beats)}}$

Temp. meas. $\frac{\text{at } + 7\,°.3 \text{ nyst. is unchanged to left}}{\div 5\,°.7 \div 6\,°.7}$

No. 126. (polycl. 1346/22 sect. H.) f. 17 years. Syphilis.

Possibly infected a month ago. Eight days ago sores appeared on the genitals where there are now hypertrophied papules. Wass. is strongly positive. Ophthalmoscopy is natural. Cerebro-spinal fluid: no Wass. Cells 0, Glob. 1, Alb. 10. She has been hard of hearing for long time, and got slight fits of dizziness a month ago. Both drum membranes are retracted.

Whisp. $\frac{0{,}30}{0{,}30}$. A. c. $\frac{15\text{ sec.}}{18\text{ sec.}}$. B. c. $\frac{13\text{ sec.}}{13\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber ↓ l.l. $\frac{30}{34}$ u. l. $\frac{1.4}{1.4}$ 20 ° water $\frac{17\text{ sec. dur. }150\text{ sec.}}{10\text{ sec. dur. }160\text{ sec.}}$ rot. $\frac{32\text{ sec.}}{26\text{ sec.}}$

5 ccm. 35 ° $\frac{12\text{ sec.}}{11\text{ sec.}}$ temp. meas. $\frac{+\,0\,°.2 \div 0\,°.4}{+\,0\,°.3 \div 0\,°.3}$

No. spont. nystagmus, past-pointing or falling tendency.

No. 127. (polycl. 1052/21 sect. H. 326/21) f. 24 years. Syphilis.

Had about 3 month ago pain in the throat and eruptions on the genitals. There is now great outbreak. Wass. positive. Ophthalmoscopy natural. Cerebro-spinal fluid: no Wass. Cells 10, Glob. < 1, Alb. $> 10 < 20$. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing, or falling-tendency.

20 ° water $\frac{14\text{ sec. dur. }120\text{ sec.}}{17\text{ sec. dur. }125\text{ sec.}}$ rot. $\frac{12\text{ sec.}}{15\text{ sec.}}$ temp. meas. $\frac{+\,1\,°.5 \div 0\,°.3}{+\,0\,°.1 \div 2\,°.0}$

No. 128. (polycl. 138/22 sect. H. 95/22) f. 28 years. Syphilis.

Possibly the husband has had syphilis 10 years ago, possibly it is a case of syphilis cong. Wass. strongly positive. Testing of the eyes shows chorio-retinitis syphilitica, as seen by syph. cong. Cerebro-spinal fluid: no Wass. Cells 1, Glob. 0, Alb. 10. Never ear cases. Tymp. mem. and hearing normal.

20 ° water $\frac{22\text{ sec.}}{20\text{ sec.}}$ rot. $\frac{28\text{ sec.}}{25\text{ sec.}}$ temp. meas. $\frac{+\,0\,°.4 \div 0\,°.6}{+\,0\,°.3 \div 0\,°.5}$

No. 129. (polycl. 2510/21 sect. H. 561/21) f. 12 years. Syphilis.

Had at the age of seven keratitis parenchymatosa and became three years ago completely deaf without foregoing ear disease. Wass. is negative. Cerebro-spinal fluid: No Wass. Cells 1.3, Glob. 2, Alb. 20. Very little hearing left. She states being able to hear different tuningforks, but it is impossible to come to understanding with her, as she cannot hear the speaking voice, and does not know how to write. Tymp. mem. natural. No spont. nystagmus or falling tendency.

20 ° water $\frac{\text{no nyst. (3 min.)}}{\text{no nyst. (3 min.)}}$ rot. $\frac{\text{no nyst.}}{\text{no nyst.}}$ temp. meas. $\frac{+\,?\,\div 21\,°.0}{+\,?\,\div 26\,°.0}$

No. 130. (polycl. 314/22 sect. H. 415/22) m. 21 years. Syphilis.

Got infected seven months ago, and was given silver salvarsan 4 times, and 50 inunctions. Became hard of hearing 3 months ago, and got then 2 intravenous injections and 20 inunctions. Has in

the latter 3 months past felt pains in left ear and left temple, besides being somewhat dizzy, and during that time got potassium iodide and bromide. Was examined 14 days ago by an ear-specialist, who found him totally deaf on left ear, which gave weak reaction to flushing with 10° water, and none to 19° water. At present (31/1 22) Wass. is slight positive. Ophthalmoscopy shows slight neuritis optica. Cerebro-spinal fluid: Wass. is strongly positive, Cells 234, Glob. 4, Alb. 40. Tymp. mem. normal.

Whisp. $\frac{> 8.00}{0}$ Shout. $\frac{\quad}{0\,(\mathrm{Ba})}$ l.l. $\frac{16}{0}$ u. l. $\frac{25.000}{0}$ no spont. nyst.

20° water $\frac{12\text{ sec. dur. }105\text{ sec.}}{15\text{ sec. dur. }128\text{ sec.}}$ rot. $\frac{23\text{ sec.}}{32\text{ sec.}}$ 5 ccm. 35° $\frac{17\text{ sec.}}{\div}$

5 ccm. 27° $\frac{\quad}{16\text{ sec.}}$ temp. meas. $\frac{+\,0°.2 \div 0°.2}{\div 2°.6}$

D. fl. 20° $\frac{420\text{ ccm.}}{450\text{ ccm.}}$ no nyst. (3 min.).

The 20/2 22 is found:

T. m. $\frac{+\,0°.3 \div 0°.2\text{ (without foregoing flushing, or after long pause)}}{+\,1°.2 \div 2°.4\text{ (+ figure got without foregoing flushing)}}$

D. fl. 20° $\frac{590\text{ ccm.}}{580\text{ ccm.}}$ no nystagmus (4 min.).

No. 131. (polycl. 966/21 sect. H. 292/21) f. 20 years. Syphilis. Knows nothing of infection. Has given birth to a syphilitic child 15 days ago. Wass. positive. There is slight leucoderma colli. Has got inunctions for 6 days. Ophthalmoscopy is natural. Lumbar puncture fails. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling tendency.

20° water $\frac{16\text{ sec. dur. }95\text{ sec.}}{18\text{ sec. dur. }100\text{ sec.}}$ rot. $\frac{25\text{ sec.}}{22\text{ sec.}}$ temp. meas. $\frac{+\,0°.2 \div 0°.2}{+\,0°.2 \div 0°.3}$

No. 132. (polycl. 294/22 sect. H. 144/22) m. 19 years. Syphilis. Not been treated before. Has got keratitis parenchymatosa dx., Iritis dx., Chorioditis dissem. sin., Hutchinson's teeth, lines on the lip. Wass. strongly positive. Cerebro-spinal fluid: No Wass. Cells 0, Glob. 2, Alb. 20. Says to have been hard of hearing on right ear now and then during the last year past. Drum membranes normal.

Whisp. $\frac{> 13.00}{> 13.00}$ A.c. $\frac{38\text{ sec.}}{38\text{ sec.}}$ B.c. $\frac{16\text{ sec.}}{15\text{ sec.}}$. Rinne $\frac{+}{+}$ l.l. $\frac{16}{16}$ u. l. $\frac{1,0}{1,9}$

No fistula symptom. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{22\text{ sec. dur. }115\text{ sec.}}{35\text{ sec. dur. }125\text{ sec.}}$ rot. $\frac{34\text{ sec.}}{35\text{ sec.}}$ 5 ccm. 35° $\frac{20\text{ sec.}}{\div}$

10 ccm. 35° $\frac{\quad}{25\text{ sec.}}$ temp. meas. $\frac{+\,0°.7 \div 1°.3}{+\,1°.1 \div 2°.5}$

D. fl. 20° $\frac{300\text{ ccm.}}{360\text{ ccm.}}$ no nystagmus (3 min.).

No. 133. (polycl. 1259/22 sect. H. 248/22) f. 27 years. Syphilis. Knows nothing about infection. Has now got macular papular syphilis. Wass. strongly positive. Ophthalmoscopy natural. Cerebro-spinal lymph: No Wass., Cells 0, Glob 0, Alb. < 10. Never had ear cases or dizziness. Tym. mem. and hearing natural. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{18 \text{ sec. dur. } 126 \text{ sec.}}{15 \text{ sec. dur. } 136 \text{ sec.}}$ rot. $\frac{36 \text{ sec.}}{31 \text{ sec.}}$ 5 ccm. 35° $\frac{13 \text{ sec.}}{17 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.4 \div 0°.6}{+ 0°.6 \div 0°.4}$

No. 134. (polycl. 1192/22 sect. H. 218/22) f. 18 years. Syphilis. Contracted syphilis 6 months ago, was then given 60 inunctions and 5 times salvarsan, and later on 15 inunctions; has not been treated for 3 months. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 0, Alb. < 10. Was a little dizzy at beginning of sickness; not since. Never humming in the ears. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{10 \text{ sec. dur. } 128 \text{ sec.}}{14 \text{ sec. dur. } 118 \text{ sec.}}$ rot. $\frac{\text{No nyst.}}{\text{No nyst.}}$ 5 ccm. 35° $\frac{15 \text{ sec.}}{16 \text{ sec.}}$

Temp. meas. $\frac{+ 1°.2 \div 0°.8}{+ 0°.4 \div 0°.8}$

D. fl. 20° $\frac{400 \text{ ccm.}}{540 \text{ ccm.}}$ no nystagmus ($3\frac{1}{2}$ min.).

D. fl. 47° $\frac{180 \text{ ccm.}}{280 \text{ ccm.}}$. Nyst. to left (75 sec.).

No. 135. (polycl. 620/22 sect. H. 135/22) m. 28 years. Syphilis. Thinks he got infected 3 months ago. Wass. a month ago strongly positive. Ophthalmoscopy natural. Cerebro-spinal lymph: No Wass., Cells 8, Glob. 3.5, Alb. 50. Has been given sublimate mixture and salvarsan 5 times, 2.70 gram in all.

Got 7 years ago a fracture of the lower jaw, and had then bleeding of left ear. Hearing is good. Never dizziness. A. d. natural, a. s. tymp. mem. cicatricial. No spont. nystagmus, past-pointing, or falling-tendency.

20° water $\frac{20 \text{ sec. dur. } 104 \text{ sec.}}{21 \text{ sec. dur. } 113 \text{ sec.}}$ rot. $\frac{24 \text{ sec.}}{28 \text{ sec.}}$ temp. meas. $\frac{+ 0°.6 \div 0°.3}{+ 0°.3 \div 0°.7}$

Without previous flushing left ear gives after 5 ccm. 35° water nystagmus after 35 sec., and immediately after flushing for temp.-meas. test left ear is again flushed with 5 ccm. 35° water whereby nystagmus is evoked after 40 sec. Later right ear is flushed with 5 ccm. 35° water, producing nystagmus after 20 sec.

D. fl. 20° $\frac{620 \text{ ccm.}}{540 \text{ ccm.}}$ vertical nyst. with hint of direction to l. (4 min.).

No. 136. (polycl. 77/22 sect. H. 100/22) m. 42 years. Syphilis, tabes dorsalis. Is said to have had syphilis many years ago, is now admitted to sect. H. for tabes. Has got inunctions 13 days, and moreover potassium iodide. Wass. positive. Eye-testing: only pupils not reacting to light. Cerebro-spinal fluid: No Wass., Cells 7, Glob. 1, Alb. 30. No ear-symptoms. Tymp. mem. and hearing natural. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{13\text{ sec. dur. } 132\text{ sec.}}{13\text{ sec. dur. } 124\text{ sec.}}$ rot. $\frac{36\text{ sec.}}{45\text{ sec.}}$ 5 ccm. 35° $\frac{23\text{ sec.}}{22\text{ sec.}}$

Temp. meas. $\frac{+0°.1 \div 0°.6}{+0°.2 \div 0°.5}$

No. 137. (polycl. 168/20 sect. H. 104/21) m. 20 years. Syphilis. Last coitus 3 weeks ago. Observed sores on penis 8 days ago. These is now a chancre. Wass. positive. Opthalsmoscopy natural. Cerebro-spinal lymph: no Wass., Cells 0, Glob. 1, Alb. 10. Got inunctions 3 days. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing, or falling-tendency.

20° water $\frac{20\text{ sec. dur. } 130\text{ sec.}}{20\text{ sec. dur. } 130\text{ sec.}}$ rot. $\frac{25\text{ sec.}}{25\text{ sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.8}{+0°.3 \div 0°.5}$

No. 138. (polycl. 212/22 sect. H. 85/22) f. 31 years. Syphilis. Knows nothing of infection. Has given birth to a syphilitic child. Wass. positive. Ophthalmoscopy natural. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 0, Alb. 10. Has got inunctions for 6 days, and salvarsan 0.10. Never ear-disease or dizziness. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{10\text{ sec. dur. } 82\text{ sec.}}{10\text{ sec. dur. } 101\text{ sec.}}$ rot. $\frac{25\text{ sec.}}{27\text{ sec.}}$ 5 ccm. 35° $\frac{12\text{ sec.}}{20\text{ sec.}}$

Temp. meas. $\frac{+0°.2 \div 0°.8}{+0°.2 \div 0°.7}$

No. 139. (polycl. 970/22 sect. H. 190/22) m. 31 years. Syphilis. Got syphilis in 1911, and was then given 4 times salvarsan; no treatment later. Is now (4/4 22) a good deal nervous, and suffers from headache and insomnia (has been torpedoed twice during the war). Wass. positive, otherwise no objective sign of syphilis. Cerebro-spinal fluid: no Wass., Cells 0, Glob. 0, Alb. 20, never had ear-disease. Tymp. mem. normal, no spont. nystagmus, past-pointing or falling-tendency.

Whisp. $\frac{> 7.00}{> 7.00}$. A. c. $\frac{27\text{ sec.}}{25\text{ sec.}}$. B. c. $\frac{15\text{ sec.}}{9\text{ sec.}}$ l.l. $\frac{16}{18}$ u.l. $\frac{\text{nat.}}{\text{nat.}}$

20° water $\frac{9\text{ sec. dur. } 140\text{ sec.}}{15\text{ sec. dur. } 135\text{ sec.}}$ rot. $\frac{24\text{ sec.}}{31\text{ sec.}}$ 5 ccm. 35° $\frac{22\text{ sec.}}{25\text{ sec.}}$

Temp. meas. $\frac{+0°.6 \div 0°.6}{+0°.4 \div 1°.4}$

D. fl. 20° $\frac{580 \text{ ccm.}}{840 \text{ ccm.}}$ nystagmus to left (4 m. 55 sec.).

D. fl. 47° $\frac{650 \text{ ccm.}}{700 \text{ ccm.}}$ no nystagmus (5 min.).

No. 140. (polycl. 1071/22 sect. H. 283/22) m. 26 years. Syphilis. Got syphilis 4 years ago, and was treated with salvarsan, later ample treatment. Wass. before always negative. Has now great outbreak with positive Wass. (re infection?). Ophthalmoscopy natural. Cerebro-spinal fluid: no Wass., Cells 0, Glob. 2, Alb. 10. He got salvarsan 0.50 three days ago. Tymp. mem. and hearing natural. By straight glance in optimum position there is weak nystagmus to left.

20° water $\frac{20 \text{ sec. dur.}}{20 \text{ sec. dur.}} \frac{90 \text{ sec.}}{100 \text{ sec.}}$ rot. $\frac{25 \text{ sec.}}{30 \text{ sec.}}$ temp. meas. $\frac{+ 2°.1 \div 0°.0}{\div 0°.3 \div 1°.3}$

D. fl. 20° $\frac{780 \text{ ccm.}}{620 \text{ ccm.}}$ spont. nystagmus unchanged after $3^1/_2$ min.

No. 141. (polycl. 1459/21 sect. H. 413/21) f. 39 years. Syphilis. Admitted to sect. H. in May 1921 with considerable syphilitic destructions in palate, throat and nose lasting 10—11 years. She was then hard of hearing in left ear. Now (2/2 22) she has besides been hard of hearing on right ear in about 2 months. Wass. in strongly positive. Cerebro-spinal lymph (20/5 21): No Wass., Cells 0, Glob. 0, Alb. < 10. She then got in May 1921, salvarsan 5 times 0.40, 40 inunctions and 32 gr. potassium iodide. Both tymp. mem. are now cicatricial. No spont. nystagmus, past-pointing, or falling-tendency.

Whisp. $\frac{0.50}{0,15}$. A.c. $\frac{29 \text{ sec.}}{20 \text{ sec.}}$. B. c. $\frac{20 \text{ sec.}}{20 \text{ sec.}}$. Rinne $\frac{+}{\div}$

Weber $\uparrow$ l.l. $\frac{20}{40}$ u.l. $\frac{17.000}{12.400}$ 20° water $\frac{17 \text{ sec. dur.}}{22 \text{ sec. dur.}} \frac{140 \text{ sec.}}{115 \text{ sec.}}$ rot. $\frac{40 \text{ sec.}}{38 \text{ sec.}}$

5 ccm. 35° $\frac{29 \text{ sec.}}{39 \text{ sec.}}$ temp. meas. $\frac{+ 0.2 \div 1.6}{+ 0.4 \div 1.4}$

No. 142. (polycl. 1126/21 sect. H. 306/21) f. 26 years. Syphilis. Has for 3 weeks noted sores on genitals. Is with child in 7th month. Wass. negative. Ophthalmoscopy normal. Cerebro-spinal fluid: No Wass., Cells 3, Glob. < 1, Alb. < 10. Tymp. mem. and hearing normal. No spont. nystagmus, past-pointing, or falling-tendency.

20° water $\frac{16 \text{ sec. dur.}}{15 \text{ sec. dur.}} \frac{112 \text{ sec.}}{110 \text{ sec.}}$ rot. $\frac{26 \text{ sec.}}{25 \text{ sec.}}$ temp. meas. $\frac{+ 1°.1 \div 0°.3}{+ 1°.1 \div 0°.3}$

No. 143. (polycl. 2167/21 sect. H. 517/21) f. 31 years. Syphilis. Her syphilis is presumably 3 years old. Has no symptoms besides positive Wass. Ophthalmoscopy natural. Cerebro-spinal fluid:

No Wass., Cells 22, Glob. 1, Alb. 10. Never had ear disease or dizziness. No spont. nystagmus or falling-tendency. In both shoulders a slight spont. past-pointing to right. Hearing is normal.

20° water $\frac{\text{11 sec. dur. 126 sec.}}{\text{10 sec. dur. 131 sec.}}$ rot. $\frac{\text{35 sec.}}{\text{36 sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.4}{+0°.2 \div 0°.4}$

No. 144. (polycl. 989/22 sect. H. 246/22) m. 27 years. Syphilis cong?

Had 3 years ago an ulcus penis, which was not supposed to have been syphilis. Three weeks ago he felt pains and smarting in the eyes. Wass. proved positive when tested at the eye-clinic, the diagnosis of which is: Chorioditis syphilitica hereditaria. Cerebro-spinal fluid: Wass. positive, Cells 70, Glob. 3.5, Alb. 10. Suffered some from dizziness a couple of years ago. Never had ear disease. Tymp. mem. and hearing normal. In optimum position spont. nystagmus to left. No spont. past-pointing or falling-tendency.

20° water $\frac{\text{11 sec. dur. 115 sec.}}{\text{11 sec. dur. 140 sec.}}$ rot. $\frac{\text{31 sec.}}{\text{50 sec.}}$ 5 ccm. 35° $\frac{\quad}{\text{9 sec.}}$

5 ccm. 40° $\frac{\text{sp. ny. unch.}}{\text{—}}$ temp. meas. $\frac{+0°.8 + 0°.2}{\div 0°.0 \div 0°.4}$

No. 145. (polycl. 2472/21 sect. H. 587/21) f. 16 years. Syphilis cong.?

Has ulcus cruris, Hutchinson teeth. Wass. negative, otherwise no sign of syphilis. Ophthalmoscopy natural. Cornea dim, view-field natural. Cerebro-spinal fluid: No Wass., Cells 2.6, Glob. 0, Alb. 10. Both tymp. membranes retracted, and light reddish. No spont. nystagmus, past-pointing, or falling-tendency.

Whisp. $\frac{0{,}20}{0{,}40}$. A. c. $\frac{\text{14 sec.}}{\text{26 sec.}}$. B. c. $\frac{\text{14 sec.}}{\text{14 sec.}}$. Rinne $\frac{?}{+}$. Weber ↑ l. l. $\frac{16}{16}$ u. l. $\frac{2{,}8}{2{,}1}$

after an air-showerbath got whisp. $\frac{0.30}{1.00}$. No fistula symptom.

20° water $\frac{\text{15 sec. dur. 131 sec.}}{\text{10 sec. dur. 174 sec.}}$ rot. $\frac{\text{35 sec.}}{\text{30 sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.4}{+0°.2 \div 0°.2}$

No. 146. (polycl. 3165/22) m. 45 years. Syphilis.

Has for two months been suffering from humming in both ears, but has never had pains, outflow or dizziness. Wass. positive. Both tymp. membranes light milky.

Whisp. $\frac{0{,}15}{0{,}15}$. A. c $\frac{\text{45 sec.}}{\text{45 sec.}}$. B. c. $\frac{\text{10 sec.}}{\text{10 sec.}}$ u. l. $\frac{1{,}3}{2{,}1}$

20° water $\frac{\text{13 sec. dur. 160 sec.}}{\text{18 sec. dur. 135 sec.}}$ 5 ccm. 35° $\frac{\text{13 sec.}}{\text{17 sec.}}$

Temp. meas. $\frac{+0°.5 \div 0°.4}{+0°.4 \div 0°.4}$

No. 147. (polycl. 982/21) f. 58 years. Mb. meniere.

Has formerly been treated for mb. meniere; has felt tolerably well the last 5 years. Nine months ago dizziness began again with

real fits, which have increased in force, and are worse than before. During these fits there is humming in right ear. Tymp. membranes normal.

Whisp. $\frac{0.25}{> 8.00}$. A.c. $\frac{8\text{ sec.}}{17\text{ sec.}}$ B. c. $\frac{6\text{ sec.}}{7\text{ sec.}}$. Rinne $\frac{+}{+}$. Weber $\downarrow$ l.l. $\frac{65}{16}$

No spont. nystagmus, past-pointing or falling-tendency (she feels a little dizzy during the test.)

20° water $\frac{17\text{ sec. dur. }130\text{ sec.}}{10\text{ sec. dur..}115\text{ sec.}}$ rot. $\frac{36\text{ sec.}}{30\text{ sec.}}$ temp. meas. $\frac{+\,0°.1 \div 0°.4}{+0°.1 \div 0°.3}$

D. fl. 20° water $\frac{210\text{ sec.}}{210\text{ sec.}}$. Nystagmus to right after about 1 min.

No. 148. (sect. 3406) f. 39 years. Mb. meniere.

Mother and mother's brother have sufferred from right side hardness of hearing without dizziness. She has for7—8 years suffered from intermittent humming in right ear, it being constant from the beginning of 1920. At the end of Dec. 1919 she suddenly got an attack of dizziness with vomiting, which lasted several hours, and in June 1920 a similar attack. Later on she has repeatedly had lesser attacks, less violent starting gradually, and lasting longer, and as a rule accompanied with vomitings. During the fits the humming in right ear had increased. The hearing on the same ear has been gradually decreasing. Tymp. membranes are normal.

24/10 20. Whisp. $\frac{3.00}{> 13.00}$. A. c. $\frac{7\text{ sec.}}{50\text{ sec.}}$. B. c. $\frac{5\text{ sec.}}{24\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber? l.l. $\frac{70}{16}$ u.l. $\frac{0,9}{0,6}$ no spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{20\text{ sec. dur. }105\text{ sec.}}{18\text{ sec. dur. }108\text{ sec.}}$ rot. $\frac{14\text{ sec.}}{18\text{ sec.}}$

Thereafter inj. pilocarpini was administred 12 times, from 24/10 to 5/11 20.

20/3 22. Had after discharge 4—5 fits of dizziness and vomiting, last time the 7/3 21, since then none. Humming continues.

Whisp. $\frac{9.00}{> 13.00}$. A.c. $\frac{24\text{ sec.}}{49\text{ sec.}}$. B.c. $\frac{10\text{ sec.}}{28\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber $\downarrow$ l.l. $\frac{36}{17}$ u.l. $\frac{2,1}{1,3}$ 20° water $\frac{24\text{ sec. dur. }119\text{ sec.}}{16\text{ sec. dur. }138\text{ sec.}}$ rot. $\frac{14\text{ sec.}}{18\text{ sec.}}$

5 ccm. 35° $\frac{16\text{ sec.}}{14\text{ sec.}}$ temp. meas. $\frac{+\,1°.1 \div 1°.1}{+\,0°.3 \div 0°.2}$

D. fl. 20° $\frac{100\text{ ccm.}}{70\text{ ccm.}}$. Nyst. to r. (25 sec.).

D. fl. 47° $\frac{85\text{ ccm.}}{65\text{ ccm.}}$. Nyst. to l. (20 sec.).

No. 149. (sect. 4274) m. 28 years. Mb. meniere.

Has for two years suffered from dizziness and imaginary rotation of the surroundings, and at the same time began to get humming in the ears, this increasing about one hour before the attacks set in. These use to come at intervals of a week up to two months. The hardness of hearing has gradually increased. There has been no attack for 3 months. Wass. is negative; tymp. membranes slightly retracted.

Whisp. $\frac{> 8.00}{\text{a.a.}}$. A.c. $\frac{42 \text{ sec.}}{7 \text{ sec.}}$. B. c. $\frac{15 \text{ sec.}}{5 \text{ sec.}}$. Rinne $\frac{+}{+}$ Weber ↑.

20° water $\frac{17 \text{ sec. dur. } 134 \text{ sec.}}{17 \text{ sec. dur. } 80 \text{ sec.}}$ rot. $\frac{21 \text{ sec.}}{31 \text{ sec.}}$ 5 ccm. 35° $\frac{20 \text{ sec.}}{22 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.4 \div 0°.4}{+ 1°.8 \div 1°.4}$

No. 150. (polycl. 894/22) f. 40 years. Mb. meniere.

In the course of the last 2—3 years humming and hardness of hearing began to set in on right ear, synchronously with attacks of dizziness, and these suddenly together with rotatory sensations, so that generally she is obliged to sit down in order not to fall. They as a rule last 2—5 min., and appear with a frequency of 1—2 times a week; but are not accompanied with vomiting, whether with increase of humming or hardness of hearing. No dizziness between attacks. No family dispositions. Tymp. mem. normal. No spont. nystagmus or falling-tendency; in left shoulder slight past-pointing outwards both in supination and in pronation; otherwise no past-pointing. Wass. is negative.

Whisp. $\frac{0.30}{> 7.00}$. A. c $\frac{9 \text{ sec.}}{21 \text{ sec.}}$. B. c $\frac{9 \text{ sec.}}{9 \text{ sec.}}$. Rinne $\frac{+}{+}$

Weber → 1.1. $\frac{90}{30}$ u 1 $\frac{1.6}{1.7}$ 20° water $\frac{13 \text{ sec. dur. } 128 \text{ sec.}}{10 \text{ sec. dur. } 143 \text{ sec.}}$ rot. $\frac{40 \text{ sec.}}{45 \text{ sec.}}$

5 ccm. 35° $\frac{20 \text{ sec.}}{27 \text{ sec.}}$ temp. meas. $\frac{+ 1°.4 \div 0°.4}{+ 0°.3 \div 1°.1}$

D. fl. 20° $\frac{290 \text{ ccm.}}{430 \text{ ccm.}}$. Nystagmus to left.

D. fl. 47° $\frac{560 \text{ ccm.}}{350 \text{ ccm.}}$. Ny. to left. (2 min. 42 sec.).

No. 151. (sect. 3521) m. 65 years. Mb. meniere.

Has, since having taken a cold in 1903, suffered from heaviness in right side of head, and has besides constantly some humming in the ears. The 14/12 1920 he got an attack of dizziness accompanied with nausea and vomiting, and had to go to bed. The attack lasted some few minutes. One and a half hours later he had a similar attack, but after that he has had none. On 10/1 21 is found: Tymp. mem. natural; no spont. nystagmus.

Whisp. $\frac{2.00}{2.00}$. A. c. $\frac{29\text{ sec.}}{21\text{ sec.}}$. B. c. $\frac{12\text{ sec.}}{9\text{ sec.}}$. Weber → l.l. $\frac{16}{16}$ u.l. $\frac{3,1}{2,7}$

Schwabach ÷ 6.

20° water $\frac{17\text{ sec. dur. }135\text{ sec.}}{17\text{ sec. dur. }160\text{ sec.}}$ rot. $\frac{25\text{ sec.}}{20\text{ sec.}}$ temp. meas. $\frac{+0°.7 \div 1°.9}{+0°.9 \div 1°.1}$

No spont. nystagmus, past-pointing or falling-tendency.

No. 152. (sect. 4051) m. 40 years. Mb. meniere. The mother is hard of hearing, without dizziness. He has been hard of hearing himself as long as he can remember. Three years ago he got his first attack of dizziness falling forward, without becomming unconscious. After that he had no attacks for a year. In periods of several months he may be free of dizziness. In middle of Dec. they began again, and have since been frequent 3—4 times a day. He has always humming in the left ear during the attacks, and between these he feels well. At present (26/4 22) is found tymp.-membranes natural; by straight glance no spont. nystagmus, by side glance to right weak nystagmus to right; by side-glance to left no nystagmus.

Whisp. $\frac{> 7.00}{1.00}$. A.c. $\frac{15\text{ sec.}}{5\text{ sec.}}$. B. c. $\frac{30\text{ sec.}}{0}$. Rinne $\frac{\div}{+}$ Weber ↑.

20° water $\frac{22\text{ sec. dur. }112\text{ sec.}}{32\text{ sec. dur. }98\text{ sec.}}$ rot. $\frac{20\text{ sec.}}{25\text{ sec.}}$ 5 ccm. 35° $\frac{25\text{ sec.}}{28\text{ sec.}}$

Temp. meas. $\frac{+0°.8 \div 0°.3}{+3°.0 \div 1°.2}$

D. fl. 20° $\frac{115\text{ ccm.}}{75\text{ ccm.}}$. Ny. to l. (25 sec.).

D. fl. 47° $\frac{155\text{ ccm.}}{115\text{ ccm.}}$. Ny. to r. (40 sec.).

No. 153. (polycl. 1348) f. 34 years. Mb. meniere.

Has for a year been suffering from hard-hearing on left ear with dizziness and humming. The dizziness comes in accesses with vomitings and increased humming in the ear. There is no augmentation of the hard-hearing during the attacks. These are placed in series, there being periods where she has them every day, and others, of up to a month, where she is free of them.

Tymp. membranes are natural; no spont. nystagmus or falling-tendency; light tendency to past-pointing outwards in both shoulders.

Whisp. $\frac{> 8.00}{0.20\text{ (Ba.)}}$. A.c. $\frac{22\text{ sec.}}{8\text{ sec.}}$. B. c. $\frac{11\text{ sec.}}{0}$

Rinne $\frac{+}{+}$ l.l. $\frac{16}{26}$ u.l. $\frac{\text{natural}}{\text{some depressed}}$

20° water $\frac{16\text{ sec. dur. }140\text{ sec.}}{16\text{ sec. dur. }155\text{ sec}}$ rot. $\frac{37\text{ sec.}}{35\text{ sec.}}$ temp. meas. $\frac{+0°.3 \div 0°.7}{+0°.3 \div 0°.6}$

D. fl. 20° after about 1 min. is got vertical nystagmus upwards.

No. 154. (polycl. 9217/17) f. 67 years. Mb. meniere.
Has been suffering from dizziness for 13 years, the attacks being most frequent in spring and autumn and may last a couple of days at a time. They used to set in quite suddenly. For the last 3 months humming in right ear.

Whisp. $\frac{8.00}{> 13.00}$. A.c. $\frac{25\text{ sec.}}{34\text{ sec.}}$. B.c. $\frac{6\text{ sec.}}{11\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber ↑ l.l. $\frac{24}{16}$ u.l. $\frac{2{,}2}{2{,}1}$ 20° water $\frac{16\text{ sec. dur. }114\text{ sec.}}{10\text{ sec. dur. }149\text{ sec.}}$

5 ccm. 35° $\frac{17\text{ sec.}}{12\text{ sec.}}$ temp. meas. $\frac{+1°.1 \div 1°.1}{+0°.3 \div 0°.4}$

D. fl. 20° $\frac{320\text{ ccm.}}{400\text{ ccm.}}$. Nystagmus to right (140 sec.).

No. 155. (polycl. 2420/21) m. 55 years. Mb. meniere.
Has for many years been hard of hearing on right ear with humming; lately got attacks of dizziness, often several daily, falling senseless. The humming and hard-hearing is not increased during the attacks. Both tymp. mem. are slightly retracted, but otherwise normal. No spont. nystagmus, past-pointing, or falling-tendency.

Whisp. $\frac{\text{a.a.}}{> 8.00}$. Speak $\frac{2.00}{\text{———}}$. A.c. $\frac{5\text{ sec.}}{23\text{ sec.}}$. B.c. $\frac{0}{10\text{ sec.}}$

Rinne $\frac{+}{+}$ l.l. $\frac{120}{16}$ u.l. $\frac{3{,}9}{1{,}8}$

20° water $\frac{13\text{ sec. dur. }144\text{ sec.}}{12\text{ sec. dur. }119\text{ sec.}}$ rot. $\frac{27\text{ sec.}}{32\text{ sec.}}$ temp. meas. $\frac{+0°.1 \div 1°.0}{+0°.1 \div 0°.7}$

No. 156. (sect. 3610) m. 50 years. Mb. meniere.
Fifteen months ago hardness of hearing and humming in right ear began to develop, and one and a half months later attacks of dizziness occurred. During the year he has got them in 4 periods, having 2—3 attacks in each with intervals of 1—2—3 days. To begin with they lasted about an hour, but in the last period, 3 weeks ago, a day or a night. Ordinarily they set in abruptly, accompanied with nausea and vomiting, and are so powerful that he almost falls. Tymp. membranes are normal. There is a slight spont. nystagmus to left with straight glance, so that series of rhytmical characteristics strokes of nystagmus appear periodically, while in other periods for about a minute there may be no nystagmus.

Whisp. $\frac{0.25}{> 14.00}$. A.c. $\frac{37\text{ sec.}}{65\text{ sec.}}$. B.c. $\frac{0}{20\text{ sec.}}$. Rinne $\frac{+}{+}$

Weber. ↓ l.l. $\frac{16}{16}$ u.l. $\frac{5{,}7}{4{,}2}$

20° water $\frac{20\text{ sec.}}{15\text{ sec.}}$ rot. $\frac{25\text{ sec.}}{35\text{ sec.}}$ temp. meas. $\frac{+0°.8 + 0°.1}{\div 0°.3 \div 0°.9}$

No. 157. (polycl. 2581/21) f. 39 years. Mb. Meniere.

She has for many years had mb. meniere, with sudden attacks of dizziness. Latterly these attacks have occurred with shorter intervals. She has formerly been treated here during a month alternately with cold and warm water flushings, but the attacks grew worse, and the treatment was stopped. However, a month later they were less severe than was ever the case. There is humming in right ear; tymp. membranes are natural, no spont. nystagmus.

Whisp. $\frac{3.00}{> 8.00}$. A. c. $\frac{10 \text{ sec.}}{29 \text{ sec.}}$. B. c. $\frac{0}{12 \text{ sec.}}$ l.l. $\frac{24}{—}$ u.l. $\frac{3.0}{1,5}$

20° water $\frac{12 \text{ sec. dur. } 118 \text{ sec.}}{14 \text{ sec. dur. } 107 \text{ sec.}}$ rot. $\frac{35 \text{ sec.}}{23 \text{ sec.}}$ 5 ccm. 35° $\frac{\div}{19 \text{ sec.}}$

10 ccm. 35° $\frac{35 \text{ sec.}}{—}$ temp. meas. $\frac{+ 0°.5 \div 1°.0}{+ 0°.3 \div 0°.3}$

D. fl. 20° $\frac{105 \text{ ccm.}}{72 \text{ ccm.}}$ nyst to r.

No. 158. (sect. 3798) m. 18 years. Mb. meniere.

The sickness began 2 years ago with attacks of dizziness together with vomitings, hard-hearing and humming in left ear, and he has later had repeated attacks of dizziness, the hard-hearing increasing simultaneously. He has twice fallen in the street, but is not senseless during the attacks. On both tymp. membranes a slight transparent pinkness is observed. No spont. nystagmus, past-pointing or falling-tendency. No fistula symptoms.

Whisp. $\frac{> 8.00}{1.00}$. A. c. $\frac{28 \text{ sec.}}{8 \text{ sec.}}$. B. c. $\frac{12 \text{ sec.}}{7 \text{ sec.}}$. Rinne $\frac{+}{\div}$ l.l. $\frac{18}{120}$ u.l. $\frac{22.000}{22.000}$

20° water $\frac{20 \text{ sec. dur. } 105 \text{ sec.}}{30 \text{ sec. dur. } 160 \text{ sec.}}$ rot. $\frac{31 \text{ sec.}}{27 \text{ sec.}}$ temp. meas. $\frac{+ 0°.4 \div 0°.3}{+ 0°.3 \div 0°.7}$

No. 159. (sect. 4243) f. 43 years. Otoclerosis, meniere-like attacks. She had Spanish »flu« four years ago. The ear-disease began 3—4 years ago with humming in left ear and impaired hearing. She has been treated with air-showerbaths, but with no effect, the hearing growing continually worse. One and a half years ago attacks of dizziness set in. They used to come with intervals of weeks or days, sometimes during 3—4 days without interruption. Most often they appear suddenly, now and then preceded by pains in the eyes. She feels a falling forward sensation. Formerly she had vomitings together with the attacks. Not during the last year. They only last some few minutes, and don't involve an increase of humming or hard-hearing. In the latter days she got inject. pilocarpin. 9 altogether. Tymp. membranes are dim with small calcium infiltrations. No spont. nyst.

Whisp. $\frac{> 8.00}{1.00}$. A. c. $\frac{43 \text{ sec.}}{11 \text{ sec.}}$. B. c. $\frac{21 \text{ sec.}}{12 \text{ sec.}}$. Rinne $\frac{+}{?}$

Weber → l.l. $\frac{16}{24}$ u.l. $\frac{19.000}{17.000}$

20° water $\frac{\text{12 sec. dur. 130 sec.}}{\text{22 sec. dur. 100 sec.}}$ rot. $\frac{\text{26 sec.}}{\text{22 sec.}}$ temp. meas. $\frac{+\,0°.5 \div 0°.2}{+\,1°.2 \div 0°.7}$

D. fl. 20° $\frac{\text{70 ccm.}}{\text{65 ccm.}}$ nystagmus to left (25 sec.).

D. fl. 48° $\frac{\text{100 ccm.}}{\text{105 ccm.}}$ nystagmus to right(32 sec.).

No. 160. (sect. 3697) m. 42 years. Mb. meniere.

No similar case in the family. One and a half years ago suddenly an attack of dizziness with humming in left ear, lasting an hour, and later on has got repeated attacks of 1—6 hours' duration. Since the beginning of these attacks impairment of the hearing has gradually developed on left ear, together with a strong humming. The 10/7 21 was found: tymp. mem. normal, no spont. nystagmus, past-pointing or falling-tendency.

Whisp. $\frac{> 8.00}{0.20}$ speak. $\frac{}{4.00}$. A.c. $\frac{48 \text{ sec.}}{8 \text{ sec.}}$. B. c. $\frac{13 \text{ sec.}}{0}$. Rinne $\frac{+}{+}$

Weber ↑l.l. $\frac{18}{80}$ u.l. $\frac{22.000}{16.000}$

20° water $\frac{\text{12 sec. dur. 131 sec.}}{\text{13 sec. dur. 134 sec.}}$ rot. $\frac{\text{26 sec.}}{\text{34 sec.}}$ temp. meas. $\frac{+\,0°.2 \div 0°.2}{+\,1°.4 \div 0°.4}$

6/1 22. During the last half of the year elapsed has had frequent attacks of dizziness without vomiting, lasting about half an hour, last time, 2 months ago.

20° water $\frac{\text{11 sec. dur. 124 sec.}}{\text{17 sec. dur. 137 sec.}}$ 5 ccm. 35° $\frac{\text{24 sec.}}{\text{32 sec.}}$

Temp. meas. $\frac{+\,0°.2 \div 0°.4}{+1°.6 \div 0°.1}$

No. 161. (polycl. 3258/21) f. 46 years. Mb. meniere.

One year ago she suddenly began to suffer from attacks of dizziness together with humming in right ear and with vomitings. Tymp. membranes are normal. In optimum-position weak nystagmus to right.

Whisp. $\frac{0.05}{> 13.00}$. A. c. $\frac{0}{37 \text{ sec.}}$. B. c. $\frac{5 \text{ sec.}}{11 \text{ sec.}}$. Rinne $\frac{\div}{+}$

Weber → l.l. $\frac{150}{18}$ u.l. $\frac{1.4}{1,4}$

20° water $\frac{\text{12 sec. dur. 130 sec.}}{\text{12 sec. dur. 160 sec.}}$ temp. meas. $\frac{\div\,0°.2 \div 0°.9}{+\,0°.6 + 0°.1}$

No. 162. (sect. 4226) f. 39 years. Obs. for vestibular disease; mb. meniere. Had in her childhood inflammation in right ear, and got 5—6 years ago gastro-intestinal catarrh with nausea and a single vomiting. After influenza $2^1/_2$ years ago she got suppuration in left ear. Now she gets attacks of dizziness together with ear-humming.

She has fallen sometimes, without, however, hurting herself. Has generally got vomitings after the attacks, which, as a rule, last about 3 minutes. A small dry perforation is found in tymp. mem. on both sides.

Whisp. $\frac{0{,}05}{0{,}60}$. A. c. $\frac{7 \text{ sec.}}{19 \text{ sec.}}$. B c. $\frac{5 \text{ sec.}}{15 \text{ sec.}}$ Rinne $\frac{+}{+}$ Weber → u.l. $\frac{3.3}{3.3}$

20 ° water $\frac{24 \text{ sec. dur. } 92 \text{ sec.}}{13 \text{ sec. dur. } 138 \text{ sec.}}$ rot. $\frac{38 \text{ sec.}}{32 \text{ sec.}}$ 5 ccm. 35 ° $\frac{21 \text{ sec.}}{25 \text{ sec.}}$

Temp. meas. $\frac{+ 1\,°.1 \div 0\,°.7}{+ 1\,°.2 \div 0\,°.9}$

D. fl. 20 ° $\frac{610 \text{ ccm.}}{490 \text{ ccm.}}$ no nystagmus (4 min.).

D. fl. 48 ° $\frac{260 \text{ ccm.}}{210 \text{ ccm.}}$ nystagmus to left (1 min.).

No. 163. (sect. 3848) m. 21 years. Neuritis acustica.

Had Spanish »flu« two years ago, and since half a year began to feel humming in right ear and dizziness, which comes in fits, and is accompanied with rotatory sensations. The humming is periodical and ceases after the termination of the dizziness fits. Neurologic investigations do not show any sign of organic nervous affection. Wass. is negative. Otoscopy natural. By straight look no nystagmus, by side-glance nystagmus to the same sides respectively.

Whisp. $\frac{> 8.00}{> .800}$. A. c. $\frac{27 \text{ sec.}}{26 \text{ sec.}}$. B. c. $\frac{9 \text{ sec.}}{9 \text{ sec.}}$ Rinne $\frac{+}{+}$

Weber → l.l. $\frac{16}{16}$ u.l $\frac{24.000}{24.000}$

20 ° water $\frac{3 \text{ sec.}}{10 \text{ sec.}}$ rot. $\frac{22 \text{ sec.}}{25 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.2 \div 1\,°.8}{+ 0\,°.0 \div 1\,°.8}$

Now infiltration-anestesia on right ear passage is made with novocaine-adrenalin, making the tymp. mem. anesthetic where upon is found:

Temp. meas. $\frac{+ 0\,°.2 \div 2\,°.1}{+ 0\,°.2 \div 1\,°.7}$

The following day D. fl. 20 ° $\frac{260 \text{ ccm}}{240 \text{ ccm}}$ nyst. to right (ca. $1^1/_2$ min.).

One week later, after administering galvanic current daily and calcium chloret thrice 2 gr. for 4 days, is found:

20 ° water $\frac{11 \text{ sec. dur. } 119 \text{ sec.}}{11 \text{ sec. dur. } 110 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.2 \div 1\,°.4}{+ 0\,°.3 \div 1\,°.6}$

D. fl. 20 ° gives nystagmus to right 35 sec.

D. fl. 47 ° nystagmus to left (64 sec.).

No. 164. (polycl. 2966/22) f. 50 years. Neuritis acust., diabetes.

Is being treated in the medical section for diabetes. The hardness of hearing began about 8 years ago by incipient climacterium together with the symptoms of diabetes. The hard-hearing has in-

creased in the course of time, especially in the last year. There are strong subjective sounds, and now and then some dizziness. Tymp. mem. normal.

Whisp. $\frac{\text{a.a.}}{\text{a.a.}}$. A. c. $\frac{5 \text{ sec.}}{12 \text{ sec.}}$. B. c. $\frac{0}{7 \text{ sec.}}$ Rinne $\frac{+}{+}$ Weber $\downarrow$ l. l. $\frac{50}{38}$

20 ° water $\frac{14 \text{ sec. dur. } 116 \text{ sec.}}{14 \text{ sec. dur. } 115 \text{ sec.}}$ 5 ccm. 35 ° $\frac{20 \text{ sec.}}{22 \text{ sec.}}$

Temp. meas. $\frac{+ 0\,°.7 \div 0\,°.3}{+ 0\,°.2 \div 0\,°.3}$

D. fl. 20 ° $\frac{400 \text{ ccm.}}{400 \text{ ccm.}}$ no nystagmus (3 min.).

D. fl. 48 ° $\frac{120 \text{ ccm.}}{140 \text{ ccm.}}$ nystagmus to left (35 sec.).

No. 165. (polycl. 2667/22) f. 39 years. Neuritis acust.

During the last two years increasing hardness of hearing together with humming in the ears and slight headache. No dizziness or outflow. Tymp. mem. normal. Wass. negative.

Whisp. $\frac{> 8.00}{0}$ speak $\frac{\quad}{\text{a.a. (Ba)}}$. A. c. $\frac{25 \text{ sec.}}{G_2\ 10 \text{ sec.}}$. B. c. $\frac{10}{0}$ Rinne $\frac{+}{+}$

Weber $\uparrow$ l. l. $\frac{\text{nat.}}{C,2}$ u. l. $\frac{\text{nat.}}{1,5}$ 20 ° water $\frac{12 \text{ sec. dur. } 123 \text{ sec.}}{14 \text{ sec. dur. } 110 \text{ sec.}}$

Rot. $\frac{40 \text{ sec.}}{32 \text{ sec.}}$ 5 ccm. 35 ° $\frac{15 \text{ sec.}}{20 \text{ sec.}}$ temp. meas. $\frac{+ 0\,°.2 \div 0\,°.3}{+ 0\,°.5 \div 0\,°.3}$

No. 166. (polycl. 3008/22) m. 57 years. Neuritis acust.?, vertigo.

Began two years ago to suffer from dizziness, occurring in fits, has once fallen. The attacks have 2—3 times been accompanied with fainting, never with vomiting. They often occur in night time, and may occasionally involve involuntary urination, but never biting of the tongue or humming in the ears. There is no epilepsy in the family. Testing of the eyes shows normal conditions. Wass. is negative. Cerebro-spinal lymph: no Wass., Cells 28, Glob 2, Alb. 20. Neurological examination: the lumbarpuncture pointing to a meningeal irritation, no other symptoms, no signs of dementia paralytica or tumor. Blood pressure 130/85. Tymp. membranes normal.

Whisp. $\frac{1.00}{0.30}$. A. c. $\frac{16 \text{ sec.}}{15 \text{ sec.}}$. B. c. $\frac{10 \text{ sec.}}{6 \text{ sec.}}$ Rinne $\frac{+}{+}$ l. l. $\frac{17}{17}$ u. l. $\frac{0,3}{0,3}$

20 ° water $\frac{6 \text{ sec. dur. } 160 \text{sec.}}{15 \text{ sec. dur. } 130 \text{ sec.}}$ rot. $\frac{35 \text{ sec.}}{32 \text{ sec.}}$ 5 ccm. 35 ° $\frac{5 \text{ sec.}}{16 \text{ sec.}}$

Temp. meas. $\frac{+ 0\,°.8 \div 0\,°.2}{+ 0\,°.6 \div 0\,°.6}$

D. fl. 20 ° $\frac{60 \text{ ccm.}}{60 \text{ ccm.}}$ nystagmus to left. (15 sec.).

D. fl. 48 ° $\frac{260 \text{ ccm.}}{240 \text{ ccm.}}$ no nystagmus (90 sec.).

(Testing interrupted, the patient refusing to continue).

No. 167. (polycl. 94/22) m. 25 years. Neuritis acustica.

Means he has been hard of hearing on both ears from childhood, has never had outflow or dizziness. Both tymp. membranes retracted.

Whisp. $\frac{0.30}{0.40}$ A. c. $\frac{20\text{ sec.}}{12\text{ sec.}}$. B. c. $\frac{7\text{ sec.}}{7\text{ sec.}}$ Rinne $\frac{+}{+}$ u.l. $\frac{3,0}{2.8}$

20° water $\frac{11\text{ sec. dur. }90\text{ sec.}}{11\text{ sec. dur. }102\text{ sec.}}$ rot. $\frac{27\text{ sec.}}{32\text{ sec.}}$ 5 ccm. 35° $\frac{16\text{ sec.}}{17\text{ sec.}}$

Temp. meas. $\frac{+0°.3 \div 0°.4}{+0°.3 \div 0°.4}$

No. 168. (sect. 3864) f. 33 years. Neuritis acust.

Admitted to the section for tumour maxillae. Has never had ear disease. Got influenza 3 years ago, was not very ill, in bed only a week. Has never suffered from dizziness. Tymp. mem. normal. Wass. negative.

Whisp. $\frac{> 13.00}{> 13.00}$. A. c. $\frac{27\text{ sec.}}{27\text{ sec.}}$. B. c. $\frac{8\text{ sec.}}{10\text{ sec.}}$ Weber ↓ l.l. $\frac{16}{16}$ u.l. $\frac{1,2}{1,2}$

No spont. nystagmus by straight glance from behind Bartel's glasses or by side-glance to right, by side-glance to left nystagmus to left.

20° water $\frac{14\text{ sec. dur. }107\text{ sec.}}{12\text{ sec. dur. }115\text{ sec.}}$ temp. meas. $\frac{+2°.1 \div 0°.1}{+0°.5 \div 0°.7}$

Two months later no spont. nystagmus by straight glance, by side-glance nystagmus to the same side respectively.

5 ccm. 35° $\frac{17\text{ sec.}}{17\text{ sec.}}$ temp. meas. $\frac{+2°.4 \div 0°.2}{+0°.2 \div 1°.0}$

D. fl. 20° $\frac{100\text{ ccm.}}{100\text{ ccm.}}$ nystagmus to r. (37 sec.).

D. fl. 48° $\frac{100\text{ ccm.}}{100\text{ ccm.}}$ nystagmus to l. (32 sec.).

No. 169. (polycl. 3106) f. 32 years. Neuritis acustica.

Removed from the neurologic clinique for examination as she suffers from dizziness. Tymp. membranes are slightly retracted. Weak spont. nystagmus to right.

Whisp. $\frac{> 8.00}{> 8.00}$. B. c. $\frac{6\text{ sec.}}{2\text{—}3\text{ sec.}}$ u.l. $\frac{1,2}{1,2}$

20° water $\frac{20\text{ sec. dur. }175\text{ sec.}}{15\text{ sec. dur. }195\text{ sec.}}$ temp. meas. $\frac{\div 0°.6 \div 1°.6}{+0°.0 \div 0°.4}$

No. 170. (sect. 3461) f. 25 years. Neuritis acustica?

Is admitted to the section for deviatio septi nasi. Has never had actual ear disease, though she is now and then somewhat hard of hearing. Both tymp. membranes are a little dim and thickened.

Whisp. $\frac{9.00}{> 13.00}$. A. c. $\frac{13\text{ sec.}}{25\text{ sec.}}$. B. c. $\frac{11\text{ sec.}}{11\text{ sec.}}$ Rinne $\frac{?}{+}$ Weber ↓.

Rot. $\frac{23\text{ sec.}}{21\text{ sec.}}$ temp. meas. $\frac{+ 0\,°.4 \div 2\,°.0}{\div 1\,°.6}$

No. 171. (polycl. 3734 sect. H. 179/22) f. 57 years. Neuritis acust. ozoena. mb. mentalis. Removed to section H for observation for syphilis cong. Cerebro-spinal fluid: No Wass., Cells 0, Glob. 0, Alb. 10. Hearing was normal until for 1½ years ago when she got a right side ear disease, reducing the hearing on this ear. Three months ago deafness on right ear, and some hardness of hearing on left ear began to develop. A. d. tymp. mem. thickened with a slight retracted cicatrice in front; a. s. tymp. mem. lightly retracted. No spont. nystagmus, past-pointing or falling-tendency.

Whisp. $\frac{0}{0.50\,(Ba)}$. A. c. $\frac{0}{12\text{ sec.}}$. B. c. $\frac{0}{7\text{ sec.}}$ Rinne $\frac{0}{+}$

Weber ↓ l.l. $\frac{0}{55}$ u.l. $\frac{0}{2{,}3}$ 20 ° water $\frac{15\text{ sec. dur.}\quad 92\text{ sec.}}{11\text{ sec. dur.}\quad 117\text{ sec.}}$ rot. $\frac{22\text{ sec.}}{20\text{ sec.}}$

5 ccm. 35 ° $\frac{\div}{\div}$ 5 ccm. 27 ° $\frac{28\text{ sec.}}{15\text{ sec.}}$ temp. meas. $\frac{+ 2\,°.0 \div 2\,°.0}{+ 0\,°.6 \div 1\,°.0}$

No. 172. (sect. 3926) m. 65 years. Neuritis acustica.

Is being treated in the section for cancer laryngis. Has been hard of hearing for many years. A. d. tymp.-mem. cicatricial; a. s. tymp. mem. slightly retracted.

Whisp. $\frac{\text{a.a.}}{0.10}$. A. c. $\frac{17\text{ sec.}}{25\text{ sec.}}$. B. c. $\frac{11\text{ sec.}}{16\text{ sec.}}$ Rinne $\frac{+}{+}$ l.l. $\frac{40}{16}$ u.l. $\frac{5{,}4}{5{,}4}$

20 ° water $\frac{16\text{ sec. dur. }119\text{ sec.}}{14\text{ sec. dur. }122\text{ sec.}}$ 5 ccm. 35 ° $\frac{23\text{ sec.}}{30\text{ sec.}}$

5 ccm. 27 ° $\frac{22\text{ sec.}}{22\text{ sec.}}$ temp. meas. $\frac{+ 0\,°.4 \div 1\,°.0}{+ 0\,°.2 \div 1\,°.1}$

No. 173. (polycl. 3310/20) f. 44 years. Neuritis acustica.

No hardness of hearing in the family. Has been hard-hearing on right ear in 7—8 years also on left ear. She has humming and ringing in the ears, and gets dizzy when bending down. Tymp. mem. natural. No spont. nystagmus or falling tendency. Wass. negative.

Whisp. $\frac{0}{0{,}10}$ shout $\frac{0\,(Ba)}{-}$. A. c. $\frac{0}{25\text{ sec.}}$. B. c. $\frac{0}{0}$ Rinne $\frac{0}{+}$ u.l. $\frac{7{,}0}{4{,}0}$

20 ° water $\frac{25\text{ sec. dur. }118\text{ sec.}}{40\text{ sec. dur. }136\text{ sec.}}$ (left ear passage very narrow)

Rot. $\frac{19\text{ sec.}}{26\text{ sec.}}$ temp. meas. $\frac{+ 2\,°.2 \div 6\,°.2}{+ 1\,°.6 \div 3\,°.2}$

No. 174. (polycl. 3606) m. 48 years. Neuritis acustica.

Has for a couple of months had ringing in right ear, and besides dizziness and right-side headache.

Tymp. membranes normal. No spont. nystagmus or falling tendency, slight past-pointing outwards in both shoulders.

Whisp. $\frac{7.00}{> 8.00}$. A.c. $\frac{16 \text{ sec.}}{33 \text{ sec.}}$. B.c. $\frac{8 \text{ sec.}}{14 \text{ sec.}}$ Rinne $\frac{+}{+}$

Weber ↓ l.l. $\frac{16}{16}$ u.l. $\frac{3{,}0}{1{,}9}$

20° water $\frac{14 \text{ sec. dur. } 115 \text{ sec.}}{15 \text{ sec. dur. } 103 \text{ sec}}$ rot. $\frac{36 \text{ sec.}}{40 \text{ sec.}}$ temp. meas. $\frac{+ 0°.3 \div 1°.7}{+ 0°.5 \div 0°.3}$

No. 175. (section 3780) f. 21 years. Neuritis acustica?

Admitted to the section for tumor laryngis. Tymp. membranes normal. Never dizziness.

Whisp. $\frac{> 13.00}{> 13.00}$ Weber ↓.

20° water $\frac{12 \text{ sec. dur. } 125 \text{ sec.}}{13 \text{ sec. dur. } 127 \text{ sec.}}$ temp. meas. $\frac{+ 0°.8 \div 0°.4}{+ 0°.4 \div 0°.6}$

No. 176. (sect. 3634) f. 21 years. Neuritis acustica?

Admitted to the section for deformatio nasi. An aunt of hers is hard of hearing, otherwise no disposition for ear disease in the family. Never affections of the ears or dizziness. Had Spanish »flu« 3 years ago. Tymp. membranes normal.

Whisp. $\frac{10.00}{> 11.00}$. A.c. $\frac{22 \text{ sec.}}{22 \text{ sec.}}$. B.c. $\frac{8 \text{ sec.}}{8 \text{ sec.}}$ Weber → l.l. $\frac{16}{16}$ u.l. $\frac{\text{norm}}{\text{norm.}}$

20° water $\frac{19 \text{ sec. dur. } 75 \text{ sec.}}{8 \text{ sec. dur. } 74 \text{ sec.}}$ rot. $\frac{17 \text{ sec.}}{17 \text{ sec.}}$ temp. meas. $\frac{+ 1°.5 \div 0°.5}{+ 0°.3 \div 0°.5}$

D. fl. 20° $\frac{460 \text{ ccm.}}{510 \text{ ccm.}}$. Nystagmus to left (ca. 2min.).

D. fl. 47° $\frac{205 \text{ ccm.}}{350 \text{ ccm.}}$. Nystagmus to r. (ca. 1 min.).

One year later:

5 ccm. 35° $\frac{\div}{17 \text{ sec.}}$ 10 ccm. 35° $\frac{19 \text{ sec.}}{}$ temp. meas. $\frac{+ 1°.4 \div 0°.4}{+ 0°.5 \div 0°.5}$

D. fl. 20° $\frac{480 \text{ ccm.}}{650 \text{ ccm.}}$. Nystagmus to l. (3 min.).

D. fl. 47°. $\frac{400 \text{ ccm.}}{520 \text{ ccm.}}$. Nystagmus to r. ($2^1/_2$ min.).

No. 177. (polycl. 2422/21) f. 18 yars. Cephalalgia. vertigo.

Had 5—6 years ago outflow from both ears, and has during the last 3 years been suffering from headache and dizziness. This generally occurs, when bending the head forwards, and only now and then, lasting some few minutes. Never dizzy when lying down quietly. Both tymp. membranes are slight retracted. Hearing is normal, and there is no spont. nystagmus, past-pointing or falling-tendency.

20° water $\frac{17 \text{ sec. dur. } 114 \text{ sec.}}{13 \text{ sec. dur. } 126 \text{ sec.}}$ rot. $\frac{26 \text{ sec.}}{24 \text{ sec.}}$ temp. meas. $\frac{+ 1^{\circ}.2 \div 0^{\circ}.2}{+ 0^{\circ}.4 \div 0^{\circ}.2}$

No. 178. (polycl. 247/22) f. 45 years. Vertigo.

Cannot lie down and cannot sleep on account of dizziness and noise in the head, especially in left side. In upright position she does not feel dizzy, only when moving the head both back and forward. Tymp. mem. and hearing normal.

20° water $\frac{18 \text{ sec.}}{16 \text{ sec.}}$ temp. meas. $\frac{+ 0^{\circ}.3 \div 0^{\circ}7}{+ 0^{\circ}.2 \div 0^{\circ}.8}$

(The exact irritability limits were not measured for extrinsic reasons).

No. 179. (polycl. 3792) m. 48 years. Vertigo. mb. cerebri?

Had 5 years ago a one day's attack of headache, dizziness, and rotatory sensation; about a year ago a similar attack, and three days ago a simple attack of dizziness without headache or vomiting. Never hardness of hearing in connection with the attacks. Now speaking-trouble. Eye-test shows: oculus dx. uncertain light-perception, old seperation of the retina; oculus sin. visus 6/12. Ophthalmoscopy natural. Cerebro-spinal fluid: Cells 0, Glob. 0, Alb. 10. Wass. neg. Neurologic diagnosis uncertain. No spont. nystagmus or past-pointing; spont. falling to right independent of position of the head.

Whisp. $\frac{> 8.00}{> 8.00}$. A.c. $\frac{25 \text{ sec.}}{16 \text{ sec.}}$. B.c. $\frac{9 \text{ sec.}}{9 \text{ sec.}}$. Rinne $\frac{+}{+}$

Weber $\rightarrow$ l.l. $\frac{16}{16}$ u.l. $\frac{15.000}{15.000}$

20° water $\frac{12 \text{ sec. dur. } 132 \text{ sec.}}{5 \text{ sec. dur. } 162 \text{ sec.}}$ rot. $\frac{37 \text{ sec.}}{38 \text{ sec.}}$ temp. meas. $\frac{+ 0^{\circ}.3 \div 0^{\circ}.2}{+ 0^{\circ}.4 \div 0^{\circ}.2}$

No. 180. (polycl. 1441/21) m. 45 years. Vertigo.

Is complaining of dizziness, occurring especially in the mornings while still in bed, and by sudden motions of the head. Never humming in the ears or hardness of hearing. Tymp. mem. and hearing normal.

20° water $\frac{11 \text{ sec. dur. } 137 \text{ sec.}}{15 \text{ sec. dur. } 140 \text{ sec.}}$ rot. $\frac{28 \text{ sec.}}{26 \text{ sec.}}$ temp. meas. $\frac{+ 0^{\circ}.1 \div 0^{\circ}.6}{+ 0^{\circ}.2 \div 0^{\circ}.7}$

No. 181. (polycl. 1340/21) m. 44 years. Vertigo.

Complains of dizziness, which has appeared spontaneously during the last year. Opthalmoscopy normal. Neurologic diagnosis: psychasthenia. Both tymp. membranes are a little dim. No spont. nystagmus, past-pointing or falling-tendency. He has however subjective sensation of falling forward; hearing normal.

20° water $\frac{25 \text{ sec. dur. } 120 \text{ sec.}}{20 \text{ sec. dur. } 100 \text{ sec.}}$ rot. $\frac{32 \text{ sec.}}{35 \text{ sec.}}$ temp. meas. $\frac{+ 2^{\circ}.6 \div 0^{\circ}.4}{+ 0^{\circ}.2 \div 2^{\circ}.5}$

D. fl. 20° $\frac{610 \text{ ccm.}}{725 \text{ ccm.}}$. No nystagmus (4 min.).

D. fl. 48° $\frac{1040 \text{ ccm.}}{1080 \text{ ccm.}}$. No nystagmus (4 min.).

No. 182. (polycl. 22/22) m. 44 years. Neurasthenia, neuritis acustica?

Has for a year had humming in left ear, dizziness and pain in the forehead, but never ear disease. The accesses occur about daily, but are quite slight, so that he does not need to stop working; they are only accompanied with increased humming in left ear. Twice he has got increased attacks, a year ago, and lately 3 weeks ago, lasting the whole day, so that he had to stay in bed, had nausea, but no vomiting. The headache has been increased in the latter for two months involving pressure in the forehead and round to the neck without distinct localization. Both tymp. membranes little dim.

Whisp. $\frac{> 8.00}{> 8.00}$ B. c. $\frac{13 \text{ sec.}}{18 \text{ sec.}}$ 20° water $\frac{15 \text{ sec.}}{15 \text{ sec.}}$ rot. $\frac{32 \text{ sec.}}{42 \text{ sec.}}$

5 ccm. 35° $\frac{17 \text{ sec.}}{17 \text{ sec.}}$ temp. meas. $\frac{+ 0°.4 \div 1°.0}{+ 0°.2 \div 1°.2}$

No spont. nystagmus, past-pointing, or falling-tendency.

No. 183. (polycl. 104/22) m. 48 years. Seq. meningitidis.

Is excessively hard of hearing after having had meningitis 1½ year old, but has never had dizziness. A. d. Tymp. mem. cicatricial; a. s. natural.

Whisp. $\frac{0}{0}$ Shout. $\frac{0}{0}$. A. c. $\frac{\quad}{4 \text{ sec.}}$. B. c. $\frac{\quad}{\text{just audible}}$ l. l. $\frac{\quad}{90}$ u. l. $\frac{0}{c,2}$

with gradual tuning-fork A. c. in 15 sec. B. c. in 7 sec. on left ear.

20° water $\frac{45 \text{ sec. dur. } 65 \text{ sec.}}{32 \text{ sec. dur. } 102 \text{ sec.}}$ 5 ccm. 35° $\frac{\div}{\div}$ 5 ccm. 27° $\frac{\div}{38 \text{ sec.}}$

Temp. meas. $\frac{+ > 10° \div 13°.7}{+ 2°.8 \div 2°.2}$

No. 184. (sect. 3912) m. 35 years. Seq. layrintiditis.

After an operation on left ear for labyrintitis totally deaf on this ear. Has now an acute suppuration of right ear.

Whisp. $\frac{> 7.00}{0}$. shout $\frac{\quad}{0}$ temp. meas. $\frac{+ 0°.3 \div 0°.4}{+ > 10° \div > 30°}$

No. 185. (polycl. 80/22) m. 25 years. Seq. meningitidis.

Was healthy as a child, but got 4 years ago, when serving as a soldier, meningitis cerebro-spinalis, and was treated with intra-spinal serumine injections; was for some time deaf in both ears, and had paresis of left side. The deafness and the paresis passed

so much that he could be discharged and sent home after the lapse of 4 months. The deafness on right ear has persisted, and there are still balancing disturbances, so that he cannot walk steadily in the dark, but must always be careful in keeping his balance. A. d. tymp. mem. slightly retracted; a. s. normal. No spont. nystagmus, past-pointing, or falling-tendency.

Whisp. $\frac{0}{> 8.0}$. shout. $\frac{0\,(Ba)}{\quad}$ 20° water $\frac{22 \text{ sec. dur. } 90 \text{ sec.}}{19 \text{ sec. dur. } 105 \text{ sec.}}$

Rot. $\frac{\text{ca. } '10 \text{ sec.}}{\text{ca. } 10 \text{ sec.}}$. 5 ccm. 35° $\frac{\div}{\div}$ 10 ccm. 35° $\frac{\div}{17 \text{ sec.}}$

5 ccm. 27° $^{19 \text{ sec.}}$ temp. meas. $\frac{+ 5°.6 \div 2°.6}{+ 0°.4 \div 1°.0}$

No. 186. (sect. 3695) m. 30 years. Seq. labyrintitidis.

Admitted for treatment for recidivity after a radical frontal cavity operation. Was last time in the section about a year ago for otit. med. supp. acuta dx. with labyrintitis, after which he got totally deaf on right ear. Left ear is sound. Otoscopy normal.

Whisp. $\frac{0}{> 8.00}$ 20° water $\frac{\text{no nyst.}}{13 \text{ sec. dur. } 122 \text{ sec.}}$

Temp. meas. $\frac{+ > 10° \div > 20°}{+ 0°.0 \div 0°.8}$

No. 187. (polycl. 1470/21) m. 67 years. Seq. labyrintitidis.

Was about a year ago sick for 2 days of dizziness and vomitings. The bed seemed to turn round, but he does not think he had got fever, he thought he had Spanish flu. Since then he sometimes has felt a little giddy, and completely deaf in right ear, but never had humming or outflow, not any attack of dizziness. In both tymp. membranes are calcium infiltrations, otherwise nothing abnormal. There is no spont. nystagmus, past-pointing or falling-tendency.

Whisp. $\frac{0}{> 8.00}$. shouting $\frac{0\,(Ba)}{\quad}$. A. c. $\frac{0}{37 \text{ sec.}}$. B. c. $\frac{0}{8}$ Rinne $\frac{-}{+}$ 1.1. $\frac{-}{16}$

20° water $\frac{23 \text{ sec. dur. } 105 \text{ sec.}}{22 \text{ sec. dur. } 115 \text{ sec.}}$ rot. $\frac{17 \text{ sec.}}{21 \text{ sec.}}$ temp. meas. $\frac{+ 2°.0 \div 1°.6}{+ 0°.6 \div 0°.8}$

D. fl. 20° $\frac{125 \text{ ccm.}}{145 \text{ ccm.}}$ ny. to r. (40 sec.).

D. fl. 47° $\frac{205 \text{ ccm.}}{210 \text{ ccm.}}$ ny. to l. (54 sec.).

No. 188. (polycl. 1472/21) f. 24 years. Otosclerosis.

No family dispositions. Has been hard of hearing in about 10 years. Has been treated here some time with tympano-vibration. Tymp. membranes natural. No spont. nystagmus.

Whisp. $\frac{0.10}{0.15}$. A.c. $\frac{14\text{ sec.}}{11\text{ sec.}}$. B. c. $\frac{20\text{ sec.}}{21\text{ sec.}}$. Rinne $\frac{\div}{\div}$

Weber $\rightarrow$ l.l. $\frac{60}{55}$ u.l. $\frac{4,9}{4,5}$

20 ° water $\frac{8\text{ sec. dur. }92\text{ sec.}}{12\text{ sec. dur. }104\text{ sec.}}$ 5 ccm. 35 ° $\frac{19\text{ sec.}}{15\text{ sec.}}$

Temp. meas. $\frac{+0°.5 \div 0°.7}{+0°.5 \div 0°.6}$

No. 189. (polycl. 2005/21) f. 29 years. Otosclerosis.

No family dispositions. Has been hard of hearing since her 17 years age, and does not consider the deafness as having got essentially worse since then. Has gone through 3 pregnancies, during which she feels increased hardness of hearing. She herself thinks it is better after delivery ,but her surroundings thinks this is not the case. She formerly suffered from humming in the ears, but not at present. Has now and then attacks of dizziness, obliging her lie down, but only for about 5 minutes. During the fits the deafness and humming are worse. Tymp. membranes are normal.

Whisp. $\frac{0.40}{0.20}$. A.c. $\frac{10\text{ sec.}}{15\text{ sec.}}$. B. c. $\frac{10\text{ sec.}}{12\text{ sec.}}$ Rinne ?

Weber $\rightarrow$ l.l. $\frac{38}{55}$ u.l. $\frac{\text{nat.}}{\text{nat.}}$

20 ° water $\frac{10\text{ sec. dur. }152\text{ sec.}}{9\text{ sec. dur. }142\text{ sec.}}$ temp. meas. $\frac{+0°.2 \div 0°.2}{+0°.1 \div 0°.3}$

No. 190. (polycl. 3796/21) f. 32 years. Otosclerosis.

The father is said to have been hard of hearing otherwise no family disposition. Hardness of hearing and humming in the ears began 8 years ago, and have both been gradually increasing. She got separated from her husband, which affected her very much, and at that period the hearing grew much worse. Tymp. membranes normal.

Whisp. $\frac{0.20}{\text{a.a.}}$. A.c. $\frac{11}{7}$. B.c. $\frac{11}{12}$ Rinne $\frac{\div}{\div}$ l.l. $\frac{70}{70}$ u.l. $\frac{2,8}{3,1}$

20 ° water $\frac{9\text{ sec. dur. }137\text{ sec.}}{11\text{ sec. dur. }132\text{ sec.}}$ 5 ccm. 35 ° $\frac{17\text{ sec.}}{20\text{ sec.}}$

Temp. meas. $\frac{\div 0°.8 \div 1°.2}{+1°.1 \div 0°.4}$

By testing right ear is found in optimum position a slight spont. nyst. to right.

No. 191. (sect. 3732) f. 21 years. Otit. med. catarrh. dupl., Rhinosclerom. Been hard of hearing in several years; both tymp. membranes somewhat retracted and light reddish.

Whisp. $\frac{0.15}{0.10}$ 20° water $\frac{7 \text{ sec. dur. } 182 \text{ sec.}}{13 \text{ sec. dur. } 149 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.3 \div 0°.4}{+ 0°.1 \div 0°.4}$

No. 192. (polycl. 3255/22) f. 16 years. Otit. med. catarrh. chr. dupl., otosclerosis?

The father, his mother and his sister are hard of hearing; in the mothers family no deafness. She herself has been hard of hearing so long she can remember, and the deafness has been gradually growing worse. She has never had dizziness or humming in the ears. Both tymp. membranes are somewhat retracted.

Whisp. $\frac{0.10}{0.15}$. A.c. $\frac{25 \text{ sec.}}{25 \text{ sec.}}$. B. c. $\frac{10 \text{ sec.}}{10 \text{ sec.}}$ Rinne $\frac{+}{+}$ l.l. $\frac{16}{16}$ u.l. $\frac{19.000}{20.000}$

20° water $\frac{9 \text{ sec. dur. } 107 \text{ sec.}}{10 \text{ sec. dur. } 122 \text{ sec.}}$ 5 ccm. 35° $\frac{15 \text{ sec.}}{18 \text{ sec.}}$

Temp. meas. $\frac{+ 0°.4 \div 0°.4}{+ 0°.4 \div 0°.4}$

No. 193. (polycl. 3934/21) f. 30 years. Otit. med. cat. chr. dupl., otosclerosis?

Does not think to have family dispositions. When a child she had diphtheria, and after that she was hard of hearing for about a month. Eleven years ago she was treated for hardness of hearing by air-showerbaths, and thinks that the treatment did her good, though she did not feel herself inconvenienced by the deafness, but her surroundings said that she heard badly. She is herself of the opinion that she has been hearing well until she got Spanish »flu« 2 years ago, after which she became nearly deaf. She was treated with air-douches with some effect. In the latter time the hearing has been impaired somewhat again, and she feels dizzy now and then especially when being tired (she is doing writing work, and is late up in the evenings). She never got real attacks of dizziness. Both tymp. membranes are dim and somewhat thickened.

Whisp. $\frac{0.05}{0.05}$. A.c. $\frac{9 \text{ sec.}}{0}$. B. c. $\frac{18 \text{ sec.}}{20 \text{ sec.}}$ Rinne $\frac{\div}{\div}$ l.l. $\frac{90}{\text{d-l}}$ u.l. $\frac{3,4}{3,4}$

20° water $\frac{15 \text{ sec. dur. } 110 \text{ sec.}}{11 \text{ sec. dur. } 139 \text{ sec.}}$ 5 ccm. 35° $\frac{\div}{20 \text{ sec.}}$ 10 ccm. 35° $\frac{32 \text{ sec.}}{}$

Temp. meas. $\frac{+ 0°.2 \div 0°.6}{+ 0°.3 \div 0°.3}$

RÉSUMÉ.

Ved en Gennemgang af de forskellige Forfattere, der tidligere har beskæftiget sig med at udmaale Reaktionens Storrelse efter Paavirkning af Vestibularapparatet med et kalorisk Irritament ses det, at man til forskellige Tider har forsøgt at maale denne ved at observere, hvilken Virkning et vist konstant Irritament, f. Eks. koldt Vand af en bestemt Temperatur, udøver paa Vestibularapparatet. Man har saaledes maalt Latenstiden, d. v. s. den Tid, der forløber fra det Øjeblik, Skylningen med det kolde Vand begynder, indtil det Øjeblik, Nystagmus indtræder. Hertil er af de forskellige Forfattere anvendt forskellig Teknik, som Regel gaaende ud paa at sikre sig, at Forsøgsbetingelserne ved hver Prøve var ensartet. Latenstiden er imidlertid i høj Grad afhængig af Forhold, der er Labyrinten uvedkommende, nemlig patologiske Tilstande og anatomiske Særegenheder i Øregang, Trommehinde og Mellemøre, hvorfor denne Maalemetode kun kan give ufyldestgørende Oplysninger. Resultatet viser da ogsaa, at man herved kun har faaet Oplysninger af tvivlsom Værdi. Nogle Forfattere har ment i den ved den kaloriske Paavirkning fremkaldte Nystagmus' Varighed at kunne faa et Maal for Vestibularapparatets Irritabilitet, men heller ikke dette har vist sig at holde Stik.

Det omtales derefter, at en væsentlig Grund til de svingende og upaalidelige Resultater beror paa, at det teoretiske Grundlag for de tidligere Maalemetoder er galt, idet Irritabiliteten nødvendigvis maa maales paa den Maade, at man prøver, hvor stærkt det kaloriske Irritament bør være, der i det enkelte Tilfælde kan udløse Reaktionen. Dette kan kun foregaa paa den Maade, at man maaler, hvor mange Grader det Vand, der virker paa Vestibularapparatet, skal afvige fra Legemstemperaturen, for at det kan fremkalde Reaktionen, og saa udtrykker Vestibularapparatets Irritabilitet ved denne Difference. Jeg gik derfor i Gang med at konstruere et Apparat, der satte mig i Stand til at paavirke Øret med Temperaturer, der ligger tæt op ad Legemstemperaturen og gjorde det muligt for mig at variere denne Temperaturvirkning efter Behag. Det viste sig at støde paa mange uforudsete Hindringer for en væsentlig Del beroende paa, at de Temperatursvingninger, som det drejede sig om, viste sig meget smaa. Det viste sig nemlig, at Vestibularapparatet, naar det reagerer normalt, udløser Nystagmus ved Temperaturpaa-

virkninger, der kun afviger Tiendedele af Grader fra Legemstemperaturen. Det Apparat, hvorved jeg er blevet staaende, er derefter nærmere beskrevet sammen med den Teknik, der er anvendt.

Ved Undersøgelse af normale Individer foretaget paa den Maade, at Udskylningen foretages med Vand paa 20°, medens Individet er anbragt i Brünings Optimumstilling og ser lige ud gennem Bartels dobbeltconvexe Briller, findes Latenstiden hos disse at ligge mellem 8 og 21 Sekunder, dog saaledes, at det største Antal Tilfælde har en Latenstid liggende mellem 10 og 15 Sekunder. Den gennemsnitlige Latenstid er 12,8 Sekunder. Varigheden af den fremkaldte Nystagmus er maalt til at være fra 85 til 202 Sekunder. Denne Værdi menes der ikke at kunne tillægges nogen større Betydning. 14 af de normale Individer er undersøgt efter Kobraks Metode, d. v. s. der er foretaget Skylning med 5 ccm. Vand af forskellig Varmegrad, varierende fra 35° til 27°. Herved er som Regel fundet, at normale Individer reagerer for Paavirkning af 5 ccm. Vand paa 35° efter 11 til 28 Sekunder; jeg har ved disse Prøver regnet ret smaa Udslag for positive (3 Nystagmuslag).

Ved Hjælp af den af mig angivne Metode (kaldet Temperaturmaalingsmetoden) har jeg undersøgt 55 normale Individer og fundet, at det Antal Grader, som Skyllevandet skal ændres fra den Temperatur, hvor det fremkalder Varmtvandsreaktion, til den Temperatur, hvor det fremkalder Koldtvandsreaktion, i intet Tilfælde er større end 1° Celsius. Den mindste fundne Totaldifferens er 0,3°. I det største Antal Tilfælde (ca. 73%) ligger Grænsen mellem 0,6 og 0,8°. Som Regel har det vist sig, at Temperaturen paa Skyllevandet skal noget mere under Legemstemperaturen end over denne for at fremkalde Nystagmus — gennemsnitlig 0,45° for koldt mod 0,25° for varmt —, hvilket tyder paa, at Ewald har Ret i, at den ampullopetale Strømning i den horizontale Buegang virker kraftigere end den ampullofugale. Nogle Forsøg er gjort for at prøve, om det af Kobrak omtalte Fænomen, Nystagmusberedskab, har nogen Indflydelse paa Resultatet af Undersøgelsen, dette synes ikke at være Tilfældet. Det normale Vestibularapparat viser sig ved denne Prøve at være saa følsom for kalorisk Paavirkning, at jeg mener, at det vil være vanskeligt at tale om nogen Hyperirritabilitet af Vestibularapparatet, i hvert Fald har jeg i de Tilfælde, der har staaet til min Disposition, hvor der efter de gængse Undersøgelser vilde skønnes at være en Hyperirritabilitet til Stede, altid fundet en nedsat Irritabilitet ved Temperaturmaalingmetoden.

Der omtales derefter nogle Tilfælde hentet fra Materialet af patologiske Ører, hvor det viser sig, at Evnen til at reagere for varmt og for koldt kan læderes uafhængigt af hinanden.

Ved en Sammenligning mellem Latenstiden maalt ved den gængse »Masseskylning« og Irritabilitetsgrænsen maalt ved Temperaturmaalingsmetoden viser det sig, at Latenstiden kun giver ufuldstændige Oplysninger, idet mange Tilfælde, hvor Vestibularapparatet efter al Sandsynlighed er lidende, viser normal Latenstid, medens Irritabilitetsgrænsen viser patologiske Tal; den forlængede Latenstid tyder som Regel paa en Lidelse af Vestibularapparatet,

naar man da kan udelukke, at ekstralabyrintære Forhold spiller ind; den forkortede Latenstid svarer ofte til en nedsat Irritabilitetsgrænse og dette Forhold tyder paa, at Latenstid og Irritabilitetsgrænse er to adskillelige Faktorer, som kan paavirkes delvis uafhængigt af hinanden, hvorfor de begge som Regel maa undersøges, hvis man vil have fuld Besked. Det foreslaas, at Latenstiden i saa Fald prøves ved Hjælp af Kobraks Metode, som den er modificeret af Demetriades og Mayer.

Ved Sammenligning mellem Kobraks Metode og Temperaturmaalingsmetoden viser det sig, at jeg til Trods for, at jeg regner med langt mindre Reaktioner end de fleste Forfattere, der har beskæftiget sig med Kobraks Metode og derfor faar meget snævrere Grænser end de fleste, dog finder adskillige Tilfælde, der ved Kobraks Metode reagerer indenfor de normale Grænser, som undersøgt ved Temperaturmaalingsmetoden viser patologiske Værdier.

I en Del Tilfælde er der gjort Dobbeltskylning ad mod. Ruttin, dog med en noget ændret Teknik; herved viser det sig, at der i et stort Antal Tilfælde er en særdeles god Overensstemmelse mellem Resultatet af Dobbeltskylningen og Temperaturmaalingsmetoden, ogsaa hvad angaar Forholdet mellem Læsionen af Evnen til at reagere for varm og kold Paavirkning. I flere Tilfælde er der imidlertid Uoverensstemmelser dels gaaende ud paa, at Dobbeltskylningen ingen Forskel viser mellem Irritabiliteten paa de to Sider, medens Temperaturmaalingsmetoden viser, at en saadan findes, dels visende sig ved, at Resultatet af Dobbeltskylningen tyder paa, at Læsionen findes paa den ene Side, medens Temperaturmaalingsmetoden viser, at den findes paa den anden. Det er ikke lykkedes at finde nogen tilfredsstillende Forklaring paa disse Uoverensstemmelser; det er dog sandsynligst, at det er Dobbeltskylningen, der i nogle Tilfælde svigter, saaledes at man maa være klar over, at denne Undersøgelse ikke er saa paalidelig som tidligere antaget. I nogle Tilfælde med spontan Nystagmus er det forsøgt ved Hjælp af Temperaturmaalingsmetoden at give et Maal for Styrken af den spontane Nystagmus, idet man maaler, hvor stærkt et Irritament, der skal til for at ophæve den spontane Nystagmus. Endelig er der i nogle Tilfælde fundet en »latent Uligevægt«; herved forstaas, at f. Eks. paa højre Øre Irritabiliteten for koldt er nedsat, medens man paa venstre Øre kun finder Nedsættelse af Irritabiliteten for varmt, saaledes at en ringe yderligere Forskydning af Billedet vilde give den samme Formel, som findes ved Tilfælde med spontan Nystagmus. Hvorvidt denne Tilstand er identisk med »Nystagmusberedskab« eller »occult Nystagmus«, er ikke undersøgt, saa Spørgsmaalet trænger til yderligere Undersøgelser.

Til Slut er Materialet gennemgaaet i Grupper, ordnet efter Sygdomme:

1) Suppurative Mellemørelidelser eller Residua efter saadanne. Omfatter 31 Tilfælde. Her findes mellem de Tilfælde, der har lidt af Svimmelhed, patologisk Reaktion ved Temperaturmaalingsmetoden i godt $^2/_3$ af Tilfældene. Blandt dem, der reagerede patologisk, fandtes der Svimmelhed hos knap $^2/_3$, medens der blandt dem, der

reagerede normalt, kun fandtes Svimmelhed hos knap 1/4. Blandt 8, der der tidligere var radicalopererede, fandtes patologisk Reaktion hos de 4. Ved 4 Tilfælde med Labyrintfistel fandtes kun nedsat Reaktion hos 1. Der gøres opmærksom paa, at Prøven i Tilfælde med Labyrintfistel til Tider kan give misvisende Resultat.

2) Syfilis. 61 Tilfælde. Det viser sig, at der findes adskillige Tilfælde, hvor Temperaturmaalingsmetoden er ene af de forskellige vestibulære Prøver om at vise, at der findes noget patologisk ved Vestibularapparatet, saaldes at denne Prøve her viser sig værdifuld til Vurdering af syfilitiske Indreørelidelser. Materialet egner sig af forskellige Grunde, for hvilke der gøres Rede, ikke til at danne sig et Skøn over disse Tilfældes Hyppighed.

3) Mb. Meniere. 16 Tilfælde. De 14 af disse er undersøgt paa et Tidspunkt, hvor der ikke fandtes nogen spontan Nystagmus, og det viser sig da, at der selv i disse rolige Perioder findes en tydelig Nedsættelse af Irritabiliteten paa det syge Øre. Tager man Gennemsnit af Irritabilitetsgrænserne for de syge Ører paa den ene Side, faar man Tallet 1,69°, medens det tilsvarende Tal for de sunde er 0,73°.

4) Neuritis acustica (uden Syfilis). 14 Tilfælde. Der findes ingen Proportionalitet mellem Graden af Tunghørighed og Irritabilitetsnedsættelse. Det viser sig, at den kaloriske Irritabilitet er nedsat i et overordentlig stort Antal Tilfælde af Indreørelidelser, selv om det ikke drejer sig om syfilitiske Lidelser. Nedsættelsen findes omtrent lige saa hyppigt i Tilfælde med Svimmelhed som i Tilfælde uden Svimmelhed.

5) Vertigo. 6 Tilfælde. Hos disse skyldes Svimmelheden forskellige Sygdomme, i nogle Tilfælde er det ikke lykkedes at stille nogen sikker Diagnose. Her findes enkelte med nedsat Irritabilitet, medens andre reagerer normalt.

6) Seq. meningitidis s. labyrintitidis. 5 Tilfælde. Viser alle større eller mindre Nedsættelse af den kaloriske Irritabilitet. I et Tilfælde, der ved de almindelige Prøver viser normal Reaktion findes ved Temperaturmaalingsmetoden en tydelig Nedsættelse, saaledes at man har Lov til at formode, at den tidligere antagne større Vulnerabilitet af n. cochlearis i Forhold til n. vestibularis ikke findes, men at det blot tidligere har skortet paa tilstrækkelig fine Maalemetoder for n. vestibularis Funktion.

7) Otosclerosis og Otit. med. cat. chr. Der findes blandt 5 Patienter med Otosclerose Klager over Svimmelhed hos 2, disse viser imidlertid normale Reaktioner, medens der findes nedsat Irritabilitet hos 2, hvor der ikke har været Svimmelhed.

Tilsidst gennemgaas Journalmaterialet.

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